WINDOWS 10 STARTS AGAIN
Microsoft goes back to basics **PG. 12**

SHADOW OF MORDOR
Is this the best *LOTR* game ever? **PG. 90**

DELL'S TITAN OF TABLETS
Super-sized 18-inch XPS tested **PG. 86**

MAXIMUM PC

MINIMUM BS • HOLIDAY 2014 • www.maximumpc.com

YOUR NEXT CPU!

INTEL SPECIAL

QUAD-CORE *vs.* SIX-CORE:

Get maximum power for your money

NVIDIA GTX 980

Hot new GPU makes all your games look awesome **PG. 40**

LG
M-DISC
CORSAIR
CORSAIR

Future

CORSAIR®

GRAPHITE SERIES 760T FULL-TOWER PC CASE

msi
msi
CORSAIR
AX860i

DRAM
Stability under pressure that's the result of superior engineering and fanatical screening for performance and reliability.

PSUs
Stable, reliable power with a focus on high output, energy efficiency, and ease of installation.

COOLING
Efficient, quiet cooling with zero maintenance and simple setup makes it easy to protect your CPU.

FANS
Physics meets design in a line of case fans that work better, and look better, too.

CORSAIR LINK™

CORSAIR LINK™
Comprehensive monitoring and control for high-performance PCs.

USB 3.0 FLASH DRIVES
High-speed data storage in rugged designs lets you safely take your data with you.

/corsair @CorsairMemory

Uniquely Gorgeous. Uniquely Cool.

The stunning new Graphite Series™ 760T is the world's first performance PC case with panoramic windowed side panels that are hinged for easy access and secured with discreet, flush-mounted latches. Inside, there's room for multiple full-sized GPUs and the sophisticated cooling you'll need to build a truly state of the art system. Each drive mount is tool free and every drive cage is modular, so you can customize your 760T to fit your exact needs.

Your PC deserves to look as good as it performs.

Learn lots more at **corsair.com/graphite-series**

MOBILE WIRELESS STORAGE
The Voyager Air™ family lets you enjoy all your videos, music and photos wherever you go.

SSDs
Amazing storage performance that will improve the speed of virtually everything you do with your PC.

KEYBOARDS
Flexible and ergonomic designs, highly customizable and built with quality components for superior key feel.

MICE
Precision gaming tools that help you play your best ... whether it's professionally, or you're just playing to win.

HEADSETS
Accurate audio reproduction for compelling gaming and the situational awareness you need for a competitive edge.

iBUYPOWER Recommends Windows® 8

GAMER PALADIN D837

$849

Intel® Core™ i5 4690K
Gigabyte® GA-Z97-D3H MB
NVIDIA® Geforce™ GT 740 2GB VC
8GB DDR3-1600 Corsair Memory
24X DVD±RW | 1TB SATA III HDD
Azza Atlas Gaming Case + 500 W Power Supply
Windows® 8.1 64-Bit

Customizable

MSI OPTIBOOST GT72

$1799

Intel® Core™ i7 4710HQ
NVIDIA® Geforce™ GTX 970M VC
17.3" Full HD Anti-Reflective 1920x1080 (16:9)
8GB DDR3-1600 Memory
DVD±RW | 1TB 7200 RPM HDD
SteelSeries Programmable Full Color Backlit Keyboard
Windows®8.1

Customizable

CHIMERA D859

$1649

Intel® Core™ i7 5820K
Gigabyte® X99 Series Mother Board
NVIDIA® Geforce™ GTX 970 2GB VC
8GB DDR4-2400 Corsair Memory
24X DVD±RW | 256GB SSD | 1TB SATA III HDD
Chimera Inferno 4 SE Case + 600 W Power Supply
Windows® 8.1 64-Bit

Customizable

Doublelift from Counter Logic Gaming
Professional eSports Player

Intel, the Intel logo, Intel Core and Core Inside are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries. All content and prices are subject to change without notice or obligation.

intel inside CORE i7
REVOLT
EVERYTHING ELSE
COMES SECOND

REVOLT
RD507
Customizable
$699
Intel® Pentium™ G3258
ASRock® B85M-ITX MB
NVIDIA® Geforce™ GTX 750 2GB VC
8GB DDR3-1600 Corsair Memory
SLIM DVD±RW | 1TB 7200 RPM HDD
Revolt Case + 250W Power Supply
Windows® 8.1 64-Bit
iBUYPOWER

Call Us:
888-462-3899
Customize Online:
ibuypower.com

MAXIMUMPC
YOUR NEXT CPU!

inside

HOLIDAY 2014

QUICKSTART

12 THE NEWS
Windows skips 9 for 10; tablet sales tank; Intel enjoys record profits; the fight for VR supremacy.

18 THE LIST
The 1980s' eight most iconic PCs.

20 TALKING TECH
SteelSeries reveals the future for headsets, mice, and keyboards.

The epic 1982 ZX Spectrum.

R&D

58 AUTOPSY
Dissecting the Apple iPhone 6.

61 HOW TO
Keep XP forever; set up a digital media library; clean up Documents folders.

66 BUILD IT
We construct an enthusiast rig around Intel's new Haswell-E "Lite" CPU.

LETTERS

22 DOCTOR
94 COMMENTS

FEATURES 26

26 SIBLING RIVALRY
We send Intel's six-core Haswell-E "Lite" CPU into battle against its four-core sister chip, "Devil's Canyon".

40 MEGA MAXWELL
Nvidia's new performance graphics chips, the GeForce GTX 980 and 970, are here. We put them to the test.

50 ESCAPISM TECH
From virtual reality to new developer techniques, discover how psychology and immersion are changing games.

IN THE LAB

80 ASUS STRIX RADEON R9 285

86 DELL XPS 18

89 SAMSUNG 850 PRO

90 *MIDDLE-EARTH: SHADOW OF MORDOR*

FIT FOR A CHAMPION

The **POSEIDON Z**
Illuminated Keyboard Series

- Fully Back-Lit
- Tt eSPORTS Certified Switches
- 5 Year Warranty
- Multi Key Rollover

See the full line up at **ttesports.com**

Tt® eSPORTS
By Thermaltake

CyberPower recommends Windows

CYBERPOWERPC

[Create The PC of Your Dreams]

Gamer Xtreme XT

Windows 8.1
GIGABYTE® X99 Chipset Mainboard
CORSAIR® 16GB DDR4 2400MHz Quad Channel Memory
2TB SATA III 6.0 7200RPM HD 32MB Cache
Nvidia® Geforce® GTX 970 4GB Direct X 11 Video Card
Zalman Gaming Headset
Nzxt® Source 340 Gaming case with 600 Watt 80+ Power
Asetek Liquid Cooling System

Intel® Core™ i7 Processor

Extreme 5960X 3.00Ghz	$ 2279
5930K 3.50Ghz	$ 1779
5820K 3.30Ghz	$ 1585

From
$ 1585

- Blu-ray 14x
- HD 7.1 600 W
- CoolerMaster®
- CoolerMaster®
- FREE Liquid Cooling

Intel® Core™ i7 Processor

4790K 4.00Ghz	$ 909
4790 3.60Ghz	$ 869

Intel® Core™ i5 Processor

4690K 3.40Ghz	$ 799
4690 3.50Ghz	$ 775
4590 3.30Ghz	$ 755
4460 3.20Ghz	$ 745

Intel® Core™ i3 Processor

4360 3.70Ghz	$ 709
4135 3.50Ghz	$ 679

Zeus Mini-I 200

Windows 8.1
GIGABYTE® B85 ITX Mainboard w/ USB 3.0 & SATA 6
CORSAIR® 8GB DDR3 1600 Mhz Dual Channel Memory
1TB SATA III 3.0 7200 RPM HD 16MB Cache
Nvidia® Geforce® GTX 750 1GB Video Card
Zalman Gaming Headset
CyberpowerPC Zeus Mini-ITX Gaming Case 350 Watt

From
$ 679

- HD 7.1 600 W
- CoolerMaster®
- CoolerMaster®

CYBERPOWERPC

Unleash The Power

[Your Unlimited Gaming Solutions]

Celeron, Celeron Inside, Centrino, Centrino Inside, Centrino Logo,Core Inside, Intel, Intel Logo, Intel Core, Intel Inside, Intel Inside Logo, Intel Viiv, Intel vPro, Itanium, Itanium Inside, Pentium, Pentium Inside, Viiv Inside, vPro Inside, Xeon, and Xeon Inside are trademarks of Intel Corporation in the U.S. and other countries. All prices are subject to change without notice or obligation. CyberPower is not responsible for any typographical and photographic errors. Copyright ©2015 CyberPower. All rights reserved.

Explore new ways to learn and stay connected with Intel Inside®.

intel inside™ CORE™ i7

Gamer Infinity 8800 Pro SE

Windows 8 .1

GIGABYTE® X99 Chipset Mainboard

CORSAIR® 32GB DDR4 2400MHz Quad Channel Memory

256 GB SATA III SSD Boot Drive

2TB SATA III DATA Hard Drive

Nvidia® Geforce® GTX 980 4GB Video

Zalman Gaming Headset

Themaltake Core V71 Full Tower Case 800 Watt 80+ Power

Asetek Liquid Cooling System

From $ 2115

Blu-ray 14x	FREE Liquid Cooling
HD 7.1 600 W	
CoolerMaster®	
CoolerMaster®	

Intel® Core™ i7 Processor

Extreme 5960X 3.00Ghz	$ 2799
5930K 3.50Ghz	$ 2299
5820K 3.30Ghz	$ 2115

Intel® Core™ i7 Processor

4790K 4.00Ghz	$ 1009
4790 3.60Ghz	$ 969

Intel® Core™ i5 Processor

4690K 3.40Ghz	$ 899
4690 3.50Ghz	$ 875
4590 3.30Ghz	$ 855
4460 3.20Ghz	$ 845

Intel® Core™ i3 Processor

4360 3.70Ghz	$ 809
4135 3.50Ghz	$ 779

Gamer Xtreme 2000

Windows 8.1

GIGABYTE® GA-Z97 Mainboard w/ USB 3.0 & SATA 6

CORSAIR® 8GB DDR3 1600 Mhz Dual Channel Memory

2TB SATA III 7200 RPM HD

Nvidia® Geforce® GTX 750TI 2GB Video Card

Zalman Gaming Headset

CyberpowerPC X-Saber Gaming Tower Case 430 Watt 80+ Power

Asetek Liquid Cooling System

DVD 24X ± RW	FREE Liquid Cooling
HD 7.1 600 W	
CoolerMaster®	
CoolerMaster®	

From $ 779

Intel® Core™ i7 Processor

4790K 4.00Ghz	$ 1185
4790 3.60Ghz	$ 1135

Intel® Core™ i5 Processor

4690K 3.40Ghz	$ 1079
4690 3.50Ghz	$ 1059
4590 3.30Ghz	$ 1035
4460 3.20Ghz	$ 1025

Intel® Core™ i3 Processor

4360 3.70Ghz	$ 989
4135 3.50Ghz	$ 949

Gamer Xtreme 3000

Windows 8.1

GIGABYTE® GA-Z97 Mainboard w/ USB 3.0 & SATA 6

CORSAIR® 16GB DDR3 1600 Mhz Dual Channel Memory

2TB SATA-III 6.0 7200 RPM HD

AMD™ R9 270 2GB Video Card

CyberpowerPC X-Titan Gaming Tower Case 600 W 80+ Power

Asetek Liquid Cooling System

Blu-ray 14x	FREE Liquid Cooling
HD 7.1 600 W	
CoolerMaster®	
CoolerMaster®	

From $ 949

Intel® Core™ i7 Processor Extreme Edition

4940XM	$2299
4910MQ	$1759
4810MQ	$1559
4700MQ	$1399

FANGBOOK EVO HX7-100

Intel® Core™ i7 Processor 4700MQ

Windows 8.1

Intel HM87 Chipset

17.3" Full HD Display 1920x1080

8GB DDR3 1600MHz Memory

1TB SATA300 Hard Drive

Nvidia® Geforce® 870M 6GB Direct X 11 Video Card

8X DVD+-RW Rewriteable Drive

Killer E2200 10/100/1000 Mbps Network Card

Killer N1202 - 802.11 b/g/n Wireless LAN

HDMI	7.9 Lb.
IEEE 1394	DVD 8X±RW
USB 3.0	4in1 Media Reader
2 hours	Built-in

From $ 1399

Intel® Core™ i7 Processor Extreme Edition

4940XM	$2739
4910MQ	$2209
4810MQ	$2009
4700MQ	$1839

FANGBOOK EVO HX7-300

Intel® Core™ i7 Processor 4700MQ

Windows 8.1

Intel HM87 Chipset

17.3" Full HD Display 1920x1080

16GB DDR3 1600Mhz Memory

64GB SATA III 6.0Gb/s SSD

1TB SATA300 Hard Drive

Nvidia® Geforce® 880M 8GB Direct X 11 Video Card

6X Blu-Ray Combo Drive

Killer E2200 10/100/1000 Mbps Network Card

Killer N1202 - 802.11 b/g/n Wireless LAN

HDMI	7.9 Lb.
IEEE 1394	DVD 8X±RW
USB 3.0	4in1 Media Reader
2 hours	Built-in

From $ 1839

CYBERPOWERPC

730 Baldwin Park Blvd., City of Industry, CA 91746

[800 707 0393
www.cyberpowerpc.com]

All Desktop systems come with 3 year Limited Warranty + lifetime toll free techsupport

NVIDIA®, nForce®, GeForce®, SLI™ are trademarks or registered trademarks of NVIDIA Corporation or its subsidiaries in the United States and other countries.
CyberPower PCs use genuine Microsoft® Windows® • www.microsoft .com/piracy/howtotell

Work easy, play hard Windows 8

THORMAX
GIANT
GIANT'S ARMOR
ENERMAX
THORMAX GIANT
ENERMAX
Platimax

Support
- E-ATX MB
- 240mm + 360mm length liquid cooler
- 4 x dual-slot VGA cards with 360mm/14" depth
- max 480mm / 18.8" add-on card
- 2 x 18cm ENERMAX Vegas fan
- unique headset holder
- easy-move sturdy handle

MAXIMUMPC

EDITORIAL
Editor-in-Chief: Gordon Mah Ung
Online Managing Editor: Jimmy Thang
Technical Editor: Tom McNamara
Contributing Editors: Alex Castle, Jeremy Laird, Josh Norem
Contributing Writers: Dan Griliopoulos, Tom Halfhill, Dave James, Leif Johnson, Paul Lilly, Chris Lloyd, Thomas McDonald, Nick Peers
Copy Editors: Mary Ricci, Andrew Westbrook
Editor Emeritus: Andrew Sanchez

ART
Group Art Director: Steve Gotobed
Art Editor: Richard Hood
Photographer: Mark Madeo

BUSINESS
Vice President, Sales:
Stacy Gaines, sgaines@futureus.com
Vice President, Strategic Partnerships:
Isaac Ugay, iugay@futureus.com
Regional Sales Manager:
Michael Plump, mplump@futureus.com
Regional Sales Manager:
Tad Perez, tperez@futureus.com
Regional Sales Manager:
Austin Park, apark@futureus.com
Regional Sales Manager:
Jessica Reinert, jreinert@futureus.com
Vice President, Marketing & Sales Development:
Rhoda Bueno
Newsstand Director:
Bill Shewey

PRODUCTION
Production Manager: Mark Constance
Production Controller: Ian Wardle
Project Manager: Clare Scott
Production Assistant: Emily Wood

FUTURE US, INC.
4000 Shoreline Court, Suite 400, South San Francisco, CA 94080
Tel: 650-872-1642, www.futureus.com

Senior Vice President: Charlie Speight
Senior Finance Manager: Wendy Chin
Human Resources Manager: Laura Millard

SUBSCRIBER CUSTOMER SERVICE
Maximum PC Customer Care,
P.O. Box 51592, Harlan, IA 51593-1352
Website: www.maximumpc.com/customerservice
Tel: 800-274-3421
Email: MAXcustserv@cdsfulfillment.com

BACK ISSUES
Website: www.maximumpc.com/shop
Tel: 800-865-7240

REPRINTS
Future US, Inc., 4000 Shoreline Court, Suite 400,
South San Francisco, CA 94080
Website: www.futureus.com
Tel: 650-872-1642, Fax 650-872-2207

Future

Future produces carefully targeted magazines, websites and events for people with a passion. We publish more than 180 magazines, websites and events and we export or license our publications to 90 countries across the world.

Future plc is a public company quoted on the London Stock Exchange.

www.futureplc.com

Non-executive Chairman: Peter Allen
Chief Executive: Zillah Byng-Maddick
Tel +44 (0)20 7042 4000 (London)
Tel +44 (0)1225 442244 (Bath)

©2014 Future US, Inc. All rights reserved. No part of this magazine may be used or reproduced without the written permission of Future US, Inc. (owner). All information provided is, as far as Future (owner) is aware, based on information correct at the time of press. Readers are advised to contact manufacturers and retailers directly with regard to products/services referred to in this magazine. We welcome reader submissions, but cannot promise that they will be published or returned to you. By submitting materials to us you agree to give Future the royalty-free, perpetual, non-exclusive right to publish and reuse your submission in any form in any and all media and to use your name and other information in connection with the submission.

Gordon
Mah Ung

ALWAYS BET ON THE PC...

THE MAINSTREAM TECH MEDIA believes the PC is the equivalent of Willy Loman from *Death of a Salesman*. Down on his luck and recently laid-off. A sad sack of a character who just can't accept he's past his prime. Sorry, wrong character. The PC is not Willy Loman, he's John Cutter in *Passenger 57*, or John McClane in *Die Hard*. Just when the bad guy thinks he's finally tossed him from the 747 or Nakatomi Plaza, he's back. Well, guess what, baby? The PC is back. Bruised, bloody, and sweaty, this action hero is angry and out to kick some butt.

There's plenty of proof that the mainstream is finally starting to see Loman morph into McClane, too. A recently conducted survey of Americans put the "satisfaction" of consumers with their new desktops above that of tablets and laptops. Yes, the desktop.

Contrast that with just three years ago, when someone who helped to create the PC, IBM CTO Mark Dean, said he'd traded in his PC for a tablet. "When I helped design the PC, I didn't think I'd live to witness its decline," Dean wrote in a blog post. "But, while PCs will continue to be much-used devices, they're no longer at the leading edge of computing. They're going the way of the vacuum tube, typewriter, vinyl records, CRT, and incandescent light bulbs."

Wrong, Mark, and quite frankly, I have a hard time believing you're really doing all of your work on a tablet. It's not just the survey data that shows mainstream consumers are turning back to the PC again. While PC sales have finally stopped a multi-year plummet and are on the mend, tablets are rapidly flattening out and heading towards single-digit growth. Even Apple's vaunted iPad is in decline, while Best Buy's CEO recently described tablets sales as "crashing."

The mainstream tech media and analysts scratched their heads and shockingly realized you don't need to buy a new tablet every year. Or even every other year. And maybe people liked using 27-inch screens for work on a new All-in-One rather than a 10-inch one. And maybe, just maybe, tablets would live alongside PCs, not replace them.

This isn't news to you, though. We've all known that the PC's ability to be almost anything you need it to be would keep it in the game. It can be the size of a book, or as large as a desk. It can play games up to 4K resolutions, or it can run on 15 watts of power. Or as Michael Dell noted this summer, "The world got enamored with smartphones and tablets. But those devices don't do everything that needs to be done. Virtual reality computing, 3D printing, robotics are all controlled by PCs. Productivity is grounded in the PC. How would you run a hospital without PCs?"

Can we get an Amen, brother? Or maybe in this case, a yippee ki-yay?

Gordon Mah Ung is Maximum PC*'s editor-in-chief, senior hardware expert, and all-around muckraker.*

↘ submit your questions to: comments@maximumpc.com

THE NEWS

Microsoft Unveils Windows 10

The Beast of Redmond goes back to desktop basics

IN THE WORLD of desktop operating systems, Windows XP had one of the longest lifespans in the business. Windows 8, not so much. It was little shocking, then, when we started hearing rumors of Windows 9 as far back as Christmas of 2013, despite Windows 8 still working out its kinks at the time. In retrospect, it should come as no surprise that Microsoft is distancing itself from Windows 8 by an entire version number, despite the two OSes not being all that different. (You can, in fact, run Windows 10 in VirtualBox just by telling the program that it's running Windows 8.1.)

Given Windows 8's lack of popularity, it occurred to us that our readers may not even be interested in checking out Win10, since it so closely resembles Win8. So we gave Microsoft's "Technical Preview" a spin for you, and we now have an after-action report.

Some system icons look different, and a few window animations have been altered, as have window border styles here and there. And as you've probably heard, the Start menu is finally back—not just the Start button that we were begrudged in Windows 8.1 after a year and half of having no button at all.

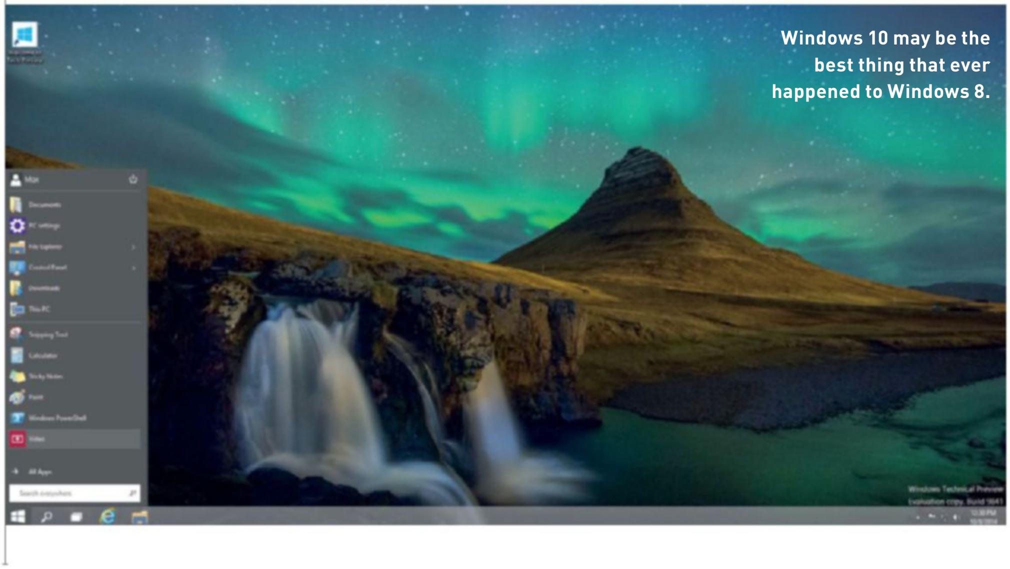
It's basically the same type of menu that we've had since Windows 95; a short list of our most popular programs, a nested menu of all programs we've installed, and shortcuts to various system folders. If the Windows 10 installer detects a desktop PC instead of a tablet, it will default to loading desktop mode instead of the tiled Modern start screen introduced in Windows 8.

You'll also notice a panel of Windows 8–style tiles that's integrated to the right of our beloved Start menu. You can resize them, move them, or delete them. If you delete them all, the panel will collapse, and you'll have a conventional-looking Start menu.

Right next to the Start menu button is a magnifying glass icon. This is a shortcut to Bing that offers search suggestions as you type, and it also doubles as a search of your computer. You can find system settings here, as well as locally stored documents, images, and videos. In this version of Windows 10, at least, we didn't come across an option to select a different search engine.

To the right of the magnifying glass is an icon that looks like overlapping squares. This controls your Task View, or virtual desktops, and simulates having multiple monitors. Clicking the Task View button gives you a small preview of the contents of each virtual desktop, and you can add and remove each desktop with a click of a button. We were able to add up to 10 of these before the "+" button ran off the side of the screen. Your desktop shortcuts, wallpaper, and taskbar items, however, don't change from one virtual desktop to the next, so its utility is a bit underwhelming.

It's not a bad thing to be just a little bit different from the last operating system. After all, Windows 7 is actually not too different from the final version of Windows Vista. Yet Windows 7 was one of the best-selling operating systems Microsoft has ever produced. A large part of it is perception. Vista eventually fixed all of its problems, except for the one thing it couldn't fix—being called "Windows Vista." Maybe Microsoft can make the Win7 lightning strike twice. **–TM**



Windows 10 may be the best thing that ever happened to Windows 8.

WORKS WITH MySQL
php
Magento Open Source eCommerce
WordPress
Joomla!
python
TYPO3
Drupal
PRESTASHOP The Best E-Commerce Experience
1&1

DOMAINS | MAIL | HOSTING | eCOMMERCE | SERVERS

NEW HOSTING

POPULAR APPS - NOW EVEN BETTER!

WordPress & Powerful App Platforms!

- Supports over 140 popular apps including WordPress, Drupal™, Joomla!™, TYPO3, and more
- Security & version upgrade notifications
- Trial version available for all applications
- App Expert Support
- 1&1 CDN powered by CloudFlare™ and 2 GB guaranteed RAM for peak performance

Powerful Tools

- PHP 5.5, Perl, Python, Ruby
- 1&1 Mobile Website Builder
- NetObjects Fusion® 2013 included

Successful Marketing

- Facebook® advertising credits
- Listing in business directories
- 1&1 Search Engine Optimization
- 1&1 E-Mail Marketing Manager

State-of-the-Art Technology

- Maximum Availability (Geo-Redundancy)
- 300 Gbit/s network connection

All Inclusive

- **1 FREE** domain: .com, .net, .org, .biz, .info
- Unlimited power: webspace, traffic, mail accounts, MySQL databases
- Secure e-mail addresses with virus and spam protection
- Linux or Windows operating system

COMPLETE PACKAGES
FOR PROFESSIONALS

Starting at **$0.99** per month*

1 TRIAL 30 DAY MONEY BACK GUARANTEE

1 MONTH FLEXIBLE PAYMENT OPTIONS

1 CALL SPEAK WITH AN EXPERT 24/7

1 (877) 461-2631

1&1®

1and1.com

* Offer valid for a limited time only. The $0.99/month pricing for the 1&1 Unlimited Hosting Package applies during promotional period only. Regular price of $8.99/month applies after promotional period. Some features listed are only available with package upgrade. Visit www.1and1.com for full promotion details. Program and pricing specifications and availability subject to change without notice. 1&1 and the 1&1 logo are trademarks of 1&1 Internet, all other trademarks are the property of their respective owners. ©2014 1&1 Internet. All rights reserved. Rubik's Cube® used by permission of Rubik's Brand Ltd.

TABLET SALES ARE TANKING

Consumers falling in love with PCs again

Has the tablet market hit saturation?

PEOPLE ARE FICKLE CREATURES. For proof, turn your attention to the technology sector. Remember when netbooks were red hot? They've since disappeared (though arguably returned in the form of Chromebooks), and now tablets are the hot item. At least, they were. According to Gartner, the tablet market is showing signs of saturation, and consumers are falling in love with traditional PCs all over again.

"Consumers' attention is slowly going back to PC purchases as tablet adoption peaked with mainstream consumers," said Mikako Kitagawa, principal analyst at Gartner. "The transition from PCs to tablets has faded as tablet penetration has reached the 40-50 percent range."

Gartner's PC shipment numbers are roughly in line with what fellow analyst IDC has also noted. According to Gartner, global PC shipments hit 79.4 million units in the third quarter of 2014. That's actually a 0.5 percent drop from the same period a year ago, but the firm saw positive results in Western Europe and North America, which it sees as a sign of recovery.

Gartner has Lenovo as the top supplier, with 19.8 percent of the market. HP is second with a 17.9 percent share, then Dell (12.8 percent), Acer (8.6 percent), and Asus (7.3 percent). Unlike IDC, Gartner didn't have Apple overtaking Asus for fifth. "For the first time, the top five's share reached two-thirds of worldwide shipments. All five showed stronger growth compared to the industry average," Gartner said.

With Windows 10 due in mid-2015, bringing the promise of greater integration between PCs and mobile devices, the most versatile and resilient platform of all looks set for yet another resurgence. **–PL**

INTEL POSTS 'BEST EVER' PROFITS

100 MILLION CPUS SHIPPED IN A SINGLE QUARTER

GO BACK A COUPLE OF YEARS and you could criticize Intel for being slow to respond to the mobile shift in the marketplace. But don't fret about any long-term repercussions. For the first time ever, Intel has shipped more than 100 million microprocessors in a single quarter. Those sales led to Intel posting a record $14.6 billion in revenue for the third quarter, along with operating income of $4.5 billion, and net income of $3.3 billion.

"We are pleased by the progress the company is making," said Intel CEO Brian Krzanich. "We achieved our best-ever revenue and strong profits in the third quarter. There is more to do, but our results give us confidence that we're successfully executing our strategy of extending our products across a broad range of exciting new markets." **–PL**

AMD TAKES ON NVIDIA FOR VR SUPREMACY

We can do low latency, too…

NVIDIA'S NEW GEFORCE GTX 980 graphics card has become the darling of the Oculus Rift VR community following claims it cuts latency by up to half. It also helps that Oculus VR used the GTX 980 at its inaugural Oculus Connect event in September. For the uninitiated, latency is a tricky challenge for VR firms such as Oculus to solve because too much latency can lead to nausea-inducing head tracking and undesired motion blur, which detract from the experience. Well, it turns out the tech that reduces latency in Nvidia graphics is also in AMD GPUs. Just AMD playing the PR game? Nope. It was actually Oculus VR software architect Tom Forsyth who revealed AMD's low-latency VR chops. **–JL**

NVIDIA
GEFORCE GTX

Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

TRIUMPHS

4.41GHz!
Great Scott. Alienware has upped its mobile gaming ante with an overclocked 4.4GHz laptop. Doc Brown would approve.

CHEAPER CHIPS
Not exactly good news for AMD. But we're not complaining. Prices for its 290 and 290X GPUs have been slashed by $100.

WHIZZY WI-FI
Hang onto your HHDs. Samsung's new 60GHz Wi-Fi can transfer a 1GB movie in just three seconds.

TRAGEDIES

OUTNUMBERED
Bad news for the human race. There are now more mobile digital devices than people on planet Earth.

KEYLOGGING CATASTROPHE
Despite the warnings, the Internets are still upset by the amount of user data Microsoft's Windows 10 Tech Preview is collecting.

FILE DROP
A bug in Dropbox's Selective Sync feature has been deleting users' files. In some cases, recovery isn't possible. D'oh!

Tom Halfhill

FAST FORWARD

Microprocessors Add Cryptography Muscle

COMPUTING IS COMING FULL CIRCLE. The world's first electronic digital computers were secretly built to break the Nazis' military ciphers. Now, microprocessors are adding special cryptography hardware with ciphers that are virtually unbreakable. This makes chips more expensive, but it's more efficient than performing the same tasks without the extra hardware.

intel
Ivy Bridge

Intel's Ivy Bridge CPU was an early crypto-capable chip.

Actually, processors have been pumping up their crypto muscle for years, but the trend will accelerate. One reason, of course, is the Internet becoming a global marketplace and the world's longest dark alley for thieves. Years ago, hackers were satisfied with mere vandalism. Now, they hijack our machines to assemble botnets, hold our data hostage, and steal our credit card numbers and digital identities. It will only get worse. We need stronger protection.

As if computer crime wasn't enough, we must now worry about government spying, too. The temptation is simply too attractive for spy agencies to resist. One fallout from Edward Snowden's revelations is keener interest in encrypted communications. As Snowden says, we can't always trust our governments, but we can trust mathematics. Some ciphers are virtually unbreakable—or at least so resistant that only massive amounts of processing power can breach them. Even the richest governments can't afford to expend that much effort. But encrypting all data will slow everything down and burn more power, hence the interest in crypto acceleration hardware.

> "Years ago, hackers were satisfied with mere vandalism. Now, they hijack our machines to steal our digital identities. It will only get worse. We need stronger protection.

On my day job, I write about networking processors that have as many as 72 cores on a single chip. You'd think these powerhouses wouldn't need help with their arithmetic, but they do. They all have crypto engines that offload the heavy math from the CPU cores. Crypto acceleration is creeping into PC processors, too. Intel's Ivy Bridge added an instruction called RDRAND, which retrieves pseudorandom numbers from an on-chip generator. Random numbers are crucial, but software-generated numbers are pseudorandom, not truly random. That's because computers are deterministic—the same inputs generate the same outputs. Although RDRAND creates numbers that are technically still pseudorandom, they're more random than usual.

Intel's Broadwell adds another instruction—RDSEED. This creates a "seed value" that generates numbers with even higher standards of randomness. Of course, paranoids will wonder if Intel built a back door for the NSA. Strong security is usually circumvented, not penetrated. But mixing Intel's random numbers with those from other sources can make any such door irrelevant.

Smartphone processors are also adding crypto acceleration. They need it most, partly because crypto processing without hardware assistance shortens battery life. Virtually all smartphones use processors based on the ARM architecture, which has been adding security features for years.

ARM's TrustZone enables a program to run in a special memory partition that's walled off. It handles the codes that are vital for public-key cryptography, which secures encrypted Internet connections—the ones that show up as "https" instead of "http."

Unless governments outlaw encryption for personal communications—or build quantum computers that can rapidly crack the toughest ciphers—microprocessors with crypto muscle are the surest way to protect privacy.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

iBUYPOWER Recommends
Windows 8

Powered by
AMD

SBX
DASH
COLOR
STORE
Welcome back!
OFF
Current lightbar colors and pattern
EDIT
Static
Pulse
Wipe
Rotate
Fire
Custom
Current system status: IDLE
CPU TEMP
GPU TEMP
NETWORK
32°
48°
531
USAGE
66%
USAGE
71%
SPEED
531.2
Kbps
Storage Status
385 GB Available
SBX

Time to win.

Call Us:
888-462-3899

Customize Online:
ibuypower.com/SBX

iBUYPOWER

AMD®, the AMD® Arrow logo, AMD® FX™, AMD® Phenom™ II and combinations thereof are trademarks of Advanced Micro Devices, Inc. All content and prices are subject to change without notice or obligation.

Thomas L. McDonald

GAME THEORY

Games Without Gameplay

FIRST-PERSON WALKERS are a welcome change of pace from the endless reiterations of tedious run 'n' gun action titles that have hollowed out the genre. But it's still a new-ish form, finding its legs as it shifts the emphasis away from traditional gameplay elements to focus on narrative and atmosphere.

***Lifeless Planet* was promising, until it succumbed to gameplay.**

Dear Esther set the tone. It wasn't any good, but it was interesting and tried to push the form in new directions. And that makes it important. *The Stanley Parable* used a similar approach, but matched it with excellent design and narrative elements to deliver a sharp commentary on gaming itself. It still stands as perhaps the best example of the genre.

Other titles, however, haven't fared so well. The worst by far is an execrable piece of trash called *Only If*, which offered the worst 30 minutes of gaming I've experienced in many a year. It's a game that seems to actively hate the gamer, functioning mostly as some kind of endurance test to determine how long a person will let a designer kick him in the groin before bailing. In the interests of journalism, I made it to a half-hour of being cursed at by an off-screen Italian stereotype while madly tapping keys and dragging my body around and being repeatedly swallowed by a black fog.

Lifeless Planet succeeded a little better, at least offering atmosphere and an intriguing story about a strangely abandoned Soviet base on Mars. It, too, eventually falls to the limits of the genre, unable to balance pure exploration with the reflexive need to provide more conventional gameplay elements. Adding jumping and some obvious barrier puzzles disturbed the narrative flow without really contributing anything interesting.

> “It's a game that seems to actively hate the gamer, functioning mostly as some kind of endurance test to determine how long a person will let a designer kick him in the groin.

This brings us to the latest and possibly best attempt to merge some gameplay elements with the first-person walker genre: *The Vanishing of Ethan Carter*, from the people behind *Bulletstorm*. For starters, *Ethan Carter* offers one of the most beautifully rendered environments I've seen this year. Its autumnal woods and abandoned buildings have a lonely, haunted feel that contributes mightily to the overall effect.

Mystery abounds within this landscape, and there is minimal guidance. (A message from the designers promises no "hand-holding" at the outset, but that isn't quite true.) You can wonder as you wander, investigating objects and locations and using a little bit of psychic power to peer into the past in your efforts to find Ethan. Everything is a mystery at the beginning, from the strange traps and dismembered body to the indications of cultic activity and other dark deeds. Advancement is mostly a matter of looking in the right places.

Apparently concerned that this wasn't enough gameplay, however, the developers bolted on a detection mechanic that requires you to place events in a sequence. It's not a bad element, but it stands out as more traditionally "gamey" for a title that appeared to be sailing boldly into purely narrative and exploration waters.

That's really the challenge, and one that not many games other than *The Stanley Parable* have met. People are still searching for the confidence to cut the gameplay tether, but once cut, we're left with something that's no longer really a game.

Thomas L. McDonald is editor-at-large of *Games Magazine*.

THE LIST

8 ICONIC '80s PCs

1981

IBM PC

IBM's bold new PC kicked off the decade. It was the start of something special.

1981

COMMODORE VIC-20

The Vic-20 became the first home PC to sell more than a million units.

1982

COMMODORE 64

The poster child for 8-bit home computing, the C64 sold an epic 12 million units.

1982

SINCLAIR ZX SPECTRUM

The Sinclair ZX Spectrum has achieved legendary status, selling over 5 million units. It deserves a place in any computing hall of fame.

1984

APPLE MACINTOSH

Apple came into its own in 1984, when it gave the world the Macintosh computer.

1984

AMSTRAD CPC

Popular for its hundreds of games, over 3 million units of the Amstrad CPC were sold.

1985

ATARI ST

It led the new gen of 16-bit powerhouses, plus was first to feature MIDI sound support.

1987

AMIGA 500

A gamer's paradise thanks to its advanced graphics and fast processor.

imprint®
Comfort Mats

COMFORT FOR BODY AND SOLE®

You'll love standing on an Original Imprint® Anti-Fatigue Comfort Mat. Give yourself – or your staff – all-day cushioning comfort with the CumulusPRO™ Commercial Grade Series. #1 Rated Standing Desk Anti-Fatigue Comfort Mat!!

There's an Imprint® Mat for every home, workplace and workspace!!

SAVE **10%** **PLUS FREE SHIPPING**
Use promo code MPCH10 • Offer expires 1/10/2015

imprintmats.com • 1-800-655-MATS
100% Satisfaction Guarantee • Lifetime Unconditional Returns

TALKING

Peripheral Potential

Headset, mouse, and keyboard expert SteelSeries offers a glimpse at the cutting-edge peripherals heading our way, in the *Maximum PC* podcast

Non-sweaty headphones, keyboards for couches, even eye-tracking tech to help gamers crush the competition. The PC peripheral market is nothing if not increasingly diverse. To scope out the latest trends, we commandeered a couple of reps from SteelSeries, one of our favorite makers of quality PC gear. It was global PR director Tori Pugliese and PR manager Travis Hezel who survived the Minimum BS treatment, explaining how we could soon be controlling games with our eyes.

Mechanical keyboard prices won't be falling soon, says SteelSeries.

Head to www.maximumpc.com to hear the whole podcast.

Maximum PC:
How do gamers pick headsets?

Tori Pugliese:
You should expect good sound, that's a given. So, it comes down to two things. First, how much you want to look like a helicopter pilot wearing something large and in charge of your head? Next, we try to make sure of the simple things, like ensuring the ear openings fit most ear sizes. So, style and comfort are the keys. What's cool about our Siberia headsets is that the overhead suspension system allows them to adjust to most head sizes.

MPC:
How do you guys combat heat build-up in enclosed ear headphones? After an hour or two it can get sweaty.

TP:
If you have a leather-padded closed headset, you're going to get sweat. If you have an open-type headset, which is what the new Siberia V3 offers, there are vents to allow air movement. It lets your ear breathe. If you have an open-type headset, it's obviously not going to be noise cancelling. But we have good passive noise reduction, so you can play for hours and you don't get that ear sweat situation.

MPC:
Tell us about your surround-sound tech.

Travis Hezel:
Siberia Elite supports Dolby 7.1 surround sound and Pro Logic llx. So it utilizes the Doppler effect, pushing air in different directions to take the 5.1 signal and turn it into simulated 7.1. When we were testing, we were blowing out the ear cups—there wasn't enough air movement. So we widened the air vents.

MPC:
Have you ever considered making headphones with multiple discreet drivers for

SteelSeries's Siberia v2 Frost Blue headset.

Sentry uses multiple IR sensors to track your eyes, explains Hezel.

better surround sound? Or does that just make the headset too heavy?

TH:
We try to build our headsets to be as comfortable as possible. You want to be able to wear them for eight hours at a time and forget you're wearing them.

TP:
That's where Dolby Digital comes in.

MPC:
One cool device we saw at E3 was the Roccat Sova wireless keyboard. You use it on your lap, it has a little mousepad, and allows you to plug in a wired USB mouse, so it turns a wired mouse into a wireless mouse. Do you have any plans for accessories that are good for the living room?

TH:
Our H Wireless product line is multiplatform. It works with Roku, Apple TV, Xbox 360, Xbox One, PS4, PC, and mobile. But we're definitely also looking at what happens when you stand up and get away from your PC.

TP:
A couple of years ago we were looking at how we might make a better console controller, but the controllers that exist now are pretty solid, it's hard to make dramatic improvements. If you had something that would allow you to put a keyboard and mouse on your lap in a living room setting, that's interesting. It's something we're looking at.

MPC:
We're big fans of VR and Oculus Rift. Do you guys have any plans to do accessories for VR?

TP:
The closest thing to that is our Sentry Eye Tracker. It's not necessarily a VR product, but you are using a different part of yourself to control and tweak your gameplay.

TH:
It uses one camera and three IR sensors to track your eyes and then translates that into a game analyzer feature. It allows you to go back and see where you were looking, to live record your teammates, and measure eye fixations. The goal is to benchmark your eye movement against pro players. A pro player might have 800 fixations per minute, for an amateur it might be nearly 3,000. It's a little like a heart rate monitor. We showed it off at E3 and we're still developing it, but hope to have something by the end of the year.

TP:
And that's just the beginning with Sentry. Our partner in Sentry is Tobii. They're working with game developers to utilize your eye as another form of controller.

TH:
A good example would be in *StarCraft 2*. You'll be able to bind a key on your mouse, hold it down, look at a certain spot on the minimap, and the screen will just snap there. So, no need to use the Control and function keys.

MPC:
One final question from a reader. Will mechanical keyboards ever go below $50?

TH:
That's tough, there are so many expensive components. Just the plastic chassis alone would be that price, then add the gold connectors and springs…

TP:
In a perfect world, maybe. But each individual switch has to register correctly on the board, it's a lot of interconnecting components. I don't see that in the near future. Maybe as the market scales and gets more mainstream—the bigger the market for mechanical keyboards, the cheaper they'll get. Tell your friends to buy mechanical keyboards! ⏻

Audio Alchemy

Is it actually possible for stereo headphones to create real surround sound?

In theory, it's possible to pack a pair of headphones with a panoply of tiny speakers, thereby generating genuine surround sound. In practice, that makes for something of a headbrick. The alternative is to use digital sound processing to conjure up surround sound from stereo soundtracks and, equally, generate simulated surround sound using stereo hardware. That can be critical, for instance, in competitive gaming when the sound of footsteps can be a matter of life and death. As for how effective simulated surround sound is, your mileage will vary. For some, the effect is quite convincing. For others, not so much. But nearly everyone gets some benefit.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

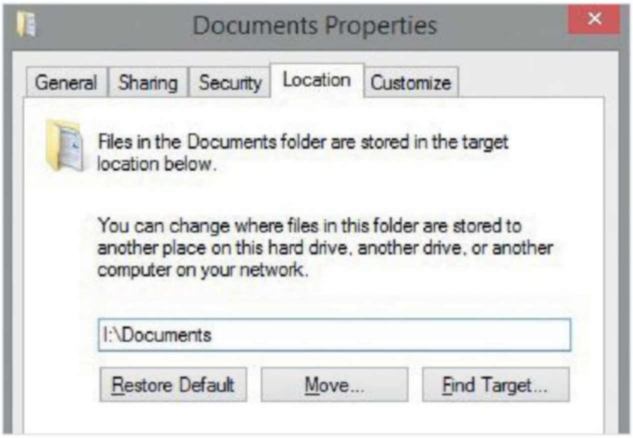
> SSD Migration
> Office 2010
> Wireless Mice

SSD and HDD Together

When installing an SSD drive besides the OS, what other programs should be installed on it? I had an SSD drive on my PC, but it died, and I had a computer tech move everything over to my regular drive. The original SSD drive was only a 60GB one, but I'm planning on buying a larger drive. Should I move all of my programs over or just my web browsers? I've been a longtime subscriber since you were known as *Boot Magazine*.

—William R. Miller II

THE DOCTOR RESPONDS: Our recommendation is that you put just your OS and all its associated programs on the SSD, while keeping all of your "data" on your regular hard drive. You should have a second regular drive, either onsite or in the cloud, to back up all that data as well. What you do is disconnect your regular drive from the system and hook up the SSD. Perform a fresh install of your OS, run Windows Update, and install drivers for your videocard and any other addons you have. Next install all the programs you need, such as web browser, PDF reader, and so on. Once your OS is running, turn off the machine and attach the regular drive with all your data and programs on it. From there you can move any data over, such as the files on your desktop and browser bookmarks. Next, change the "save file" locations from their defaults on the C: drive to the other drive. You do this by right-clicking the locations in Win8 and selecting Properties. Click the button labeled "Set save location" and navigate to the appropriate folder on the other drive. Do this for Music, Documents, Photos, Videos, and any others. Now when you save files to Photos, for example, they will go to the "regular hard drive." You can also just right-click the location in Windows Explorer, select Properties, go to the Location tab, and select "Move..." to accomplish this.



Files in the Documents folder are stored in the target location below.

You can change where files in this folder are stored to another place on this hard drive, another drive, or another computer on your network.

I:\Documents

You can easily change the target for file saving and access via the Properties tab of any folder in Windows.

Once it's set up, your OS will be on the SSD and your data will be saved to the hard drive.

Kernel Chaos

I've been having problems with my system randomly running incredibly slow and freezing for a minute or two before speeding back up. I'm generally not doing anything system intensive, just web browsing or listening to music. I've pulled up Task Manager and it will show the process labeled as "System" at 100 percent disk utilization. I've identified it is "ntoskrnl.exe" causing this problem. Searching the web I've found this is a common problem but there are no solutions. Any ideas? I'm running Windows 8.1 Pro 64-bit with all the current updates, Intel Core 2 Duo Quad-Core processor, 4GB DDR3 RAM, and an MSI G41M-P34 motherboard.

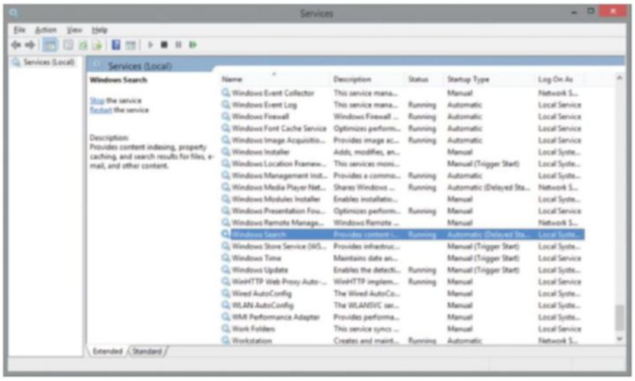
—Kyle

THE DOCTOR RESPONDS: This is a tricky problem Kyle, and based on our research can be caused by a number of issues. First, update all of your drivers. And we mean every driver, including those for a Bluetooth mouse, your Ethernet card, headphones, mobo chipset, and more. You can do it manually, but we recommend using SlimDrivers as it makes everything incredibly easy. If that doesn't work, it's possible the Windows Search Indexer is to blame. This is a utility that indexes files when the system is idle. Disable this to see if it helps. Type "services" from the Win8 Start Screen, or in the Run dialog type "Services.msc." Scroll down to Windows Search, right-click, and select Properties. Then set it to "Stopped." You can also set it to "Manual," so you can stop and start it at your command.

MS Support Woes

I added an SSD to my computer and reinstalled my OS and applications, including MS Office 2010. I'm using a Samsung 840 EVO 120GB SSD, Win7 Home

↘ submit your questions to: doctor@maximumpc.com



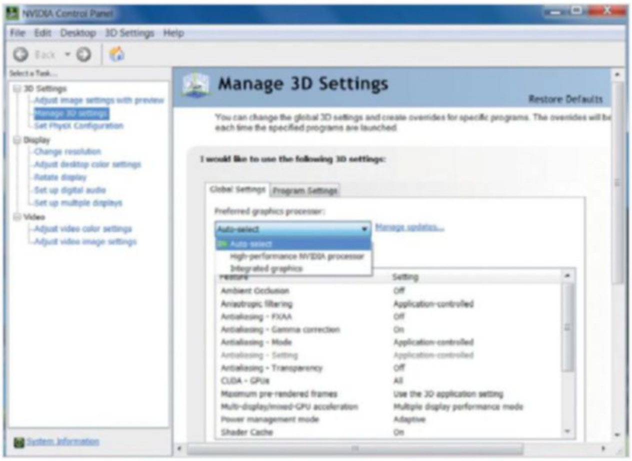
Windows Search

Stop the service
Restart the service

Description:
Provides content indexing, property caching, and search results for files, e-mail, and other content.

Name	Description	Status	Startup Type	Log On As
Windows Event Collector	This service mana...		Manual	Network S...
Windows Event Log	This service mana...	Running	Automatic	Local Service
Windows Firewall	Windows Firewall ...	Running	Automatic	Local Service
Windows Font Cache Service	Optimizes perform...	Running	Automatic	Local Service
Windows Image Acquisitio...	Provides image ac...	Running	Automatic	Local Service
Windows Installer	Adds, modifies, an...		Manual	Local Syste...
Windows Location Framew...	This services moni...		Manual (Trigger Start)	Local Syste...
Windows Management Inst...	Provides a commo...	Running	Automatic	Local Syste...
Windows Media Player Net...	Shares Windows ...	Running	Automatic (Delayed Sta...	Network S...
Windows Modules Installer	Enables installatio...		Manual	Local Syste...
Windows Presentation Fou...	Optimizes perform...	Running	Manual	Local Service
Windows Remote Manage...	Windows Remote ...		Manual	Network S...
Windows Search	Provides content i...	Running	Automatic (Delayed Sta...	Local Syste...
Windows Store Service (WS...	Provides infrastruc...		Manual (Trigger Start)	Local Syste...
Windows Time	Maintains date an...		Manual (Trigger Start)	Local Service
Windows Update	Enables the detecti...	Running	Manual (Trigger Start)	Local Syste...
WinHTTP Web Proxy Auto-...	WinHTTP implem...	Running	Manual	Local Service
Wired AutoConfig	The Wired AutoCo...		Manual	Local Syste...
WLAN AutoConfig	The WLANSVC ser...		Manual	Local Syste...
WMI Performance Adapter	Provides performa...		Manual	Local Syste...
Work Folders	This service syncs ...		Manual	Local Service
Workstation	Creates and maint...	Running	Automatic	Network S...

Windows Search Indexer likes to suck on your CPU's teat when the system is idle. Luckily, you can stop it any time you like.



Manage 3D Settings

You can change the global 3D settings and create overrides for specific programs. The overrides will be each time the specified programs are launched.

I would like to use the following 3D settings:

Preferred graphics processor:

Auto-select
- Auto-select
- High-performance NVIDIA processor
- Integrated graphics

Feature	Setting
Ambient Occlusion	Off
Anisotropic filtering	Application-controlled
Antialiasing - FXAA	Off
Antialiasing - Gamma correction	On
Antialiasing - Mode	Application-controlled
Antialiasing - Setting	Application-controlled
Antialiasing - Transparency	Off
CUDA - GPUs	All
Maximum pre-rendered frames	Use the 3D application setting
Multi-display/mixed-GPU acceleration	Multiple display performance mode
Power management mode	Adaptive
Shader Cache	On

You can use the Nvidia Control Panel to force your laptop to use discrete graphics, but battery life will suffer.

Premium, and a 1TB HDD for programs. My CPU is an Intel Core i5-4670 with an Asus Z87-Pro mobo. The problem is MS Office Pro didn't activate because the software is for three PCs, and Microsoft thinks it's on more than three because I've had to reactivate it several times. I called MS support, allowed them to take remote control, and they activated it. However, recently, every time I turn on my computer it detects new security updates for Office, which download but will not install. I tried to uninstall (to reinstall) and repair MS Office through the Control Panel but I got an error. I called MS Support and was told the warranty is only for three months and that I need to pay $100 for a one-year warranty. I'm outraged that MS Support somehow "locked" their software and then want to charge me to do something about it. Please advise me what alternatives I have.

—John

THE DOCTOR RESPONDS: The Doc thinks there are two things being mixed up here. The first is direct support for Office 2010. That is likely over, depending on when you bought your Office 2010. The warranty is usually tied to the first date it is activated. The key word here is activation. Microsoft will not give you free warranty support, but it should activate the product on the machine it's on without having the warranty support. It always has in the past. Your real problem is not being able to uninstall and reinstall it. Frankly, on a clean install of Win7 with a clean install of Office 2010, there should be no issues. You may want to do a clean install with only the SSD in place. Install the drivers for your hardware, update Win7, and then install Office 2010. Also download the two Service Packs for Office 2010 and install those. Once those are installed, fire up Word. If it asks to activate, attempt it across the Internet. If that doesn't work, perform a phone activation. You'll need to be in front of your PC to read off enough digits to think you've just authenticated the launch codes for a ballistic missile. If that fails, the phone activation will usually let you speak to a live person. Explain that your drive failed and you had to reinstall and they should give you the code to activate it. Once it's activated, start Word. It will ask you if you want Windows Update to check for updates for it. Say yes. Run Windows Update no less than three times with reboots in between until all of the updates are installed. If Microsoft gives you a hard time, you should know that Office 2010 retail ties the keys to the device but they're not permanently attached. You can rebuild, swap mobo, or move the license to your laptop. It should not matter. With Office 2013, Microsoft tried to change that, but facing an intense backlash, the company reversed its policy.

CPU and GPU Turf War

I have a Toshiba X875-Q7190 laptop. It has a GPU built into the CPU and a discreet GPU. With some files, particularly PDFs, it takes a tremendous amount of time to render successive pages. My thought is that it's utilizing the CPU-based GPU. How can I get the laptop to always use the discreet videocard?

—Chris

THE DOCTOR RESPONDS: A more worthwhile endeavor might be to try other PDF readers. Foxit Reader, for example, is both good and free. If that still doesn't do it for you, you can force your notebook to run on its discrete GPU by right-mouse clicking on the desktop. Select Nvidia Control Panel, then Manage 3D Settings, click the drop-down menu under Preferred Graphics Processor, and then select your "high performance Nvidia processor."

Rodent Rage

I'm running Windows 8.1 on my new Digital Storm PC. I connected my Razer Mamba 2012 wireless mouse and from time to time, it freezes. The battery lights on the mouse stay on, but the pointer freezes. When I plug the wired cable into the mouse it works like normal. I'm using the latest mouse firmware and have reapplied it as well. I'm also using the latest Synapse software and have uninstalled and reinstalled it. I've even changed USB ports where the mouse is plugged in. I've contacted Razer and they told me to do the things I already did. Beyond that, they said the mouse is not in warranty any longer and can't help further. Any thoughts?

—Jav

THE DOCTOR RESPONDS: Troubleshooting wireless problems from afar is near impossible, but we can suggest a few steps. First of all, it sounds like you've done all the basic steps we'd recommend for any hardware that is acting up, which includes updating drivers, trying a different port, and making sure the firmware is up to date. You clearly know what you're doing. The next thing is to try and isolate the issue—is the mouse broken or is it your PC? Take the mouse to work or to a friend's house and see if it works in wireless mode there. If so, we know the problem is with how it's communicating with your rig, but that it still works. If it's broken in a second location with a different PC, then you have a lemon, but at least you know what the problem is. Lastly, we'd recommend seeing if the wireless communication is being interferred with where your PC is residing. We know you can't easily move your rig but we'd recommend trying the wireless setup somewhere else in your house just to rule out one final cause of disruption. Since it's out of warranty, there's not much you can do if it's broken (which all signs indicate it is), but at least you can sleep at night knowing what's causing the issue. ⏻

SAGER
THE PORTABLE POWER PEOPLE

CHOOSE
YOUR
WEAPON

CHOOSE WISELY AT
SAGERNOTEBOOK.COM

Sager recommends Windows.

NP 9377-S

- 4th Generation Intel® Core™ i7-4710MQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 17.3" Full HD LED Display (1920x1080) with Matte Finished Screen
- 30 days No Dead Pixel Guaranteed Insurance
- 8GB DDR5 NVIDIA® GeForce™ GTX 980M GPU
- Optional Dual NVIDIA® GeForce™ GTX 970M / 980M GPU with SLI™ Technology
- 16GB Dual Channel DDR3-1600MHz Memory
- 120GB Crucial M500 mSATA III SSD
- 1TB 7200RPM SATA II Hard Drive
- 6X Blu-ray Reader / 8X DVD±R/2.4X +DL Super Multi Drive
- 2 Hard Drives + 2 mSATA SSD Drives Capable with Raid 0, 1 Function
- Full sized Keyboard with LED backlight
- Intel® Dual Band Wireless-AC 7260 Wireless LAN + Bluetooth Wireless Combo
- Built-in Card Reader, Fingerprint Reader and Dual Camera 5.0M / 2.0M HD Video Cam
- Thunderbolt Port & HDMI 1.4 output Port
- Built-in Onkyo speakers and a sub-woofer
- Sound Blaster® X-Fi™ MB3 Sound System
- Microsoft® Office 2013 Trial*

intel inside CORE™ i7

$2199
AFTER $150 INSTANT SAVINGS!

Dealer/VAR, Government and Corporate pricing are available. Please call for details.

Sager One Year Limited Warranty Policy: 30-Day Money-Back Guarantee. If the equipment does not work as promised, or if you are not fully satisfied, we will issue a full refund upon the return of all original equipment. 1-Year Parts and Labor Limited Warranty. Lifetime Toll-Free Technical Support. Sager One Year Limited Warranty and Three Year Limited Warranty Policy Applies to End Users in the United States of America only. **Extended Warranty Available:** Check out this comprehensive package of service/support. **Business Leasing Available:** Get your dream notebook with low monthly payments! **Sager Corporate Offices** 18005 Cortney Court, City of Industry, California 91748 Tel: 626.964.8682, Fax: 626.964.2381 Hours: Monday-Friday 7:30a.m. - 6p.m.(PST) American Express, VISA, MasterCard & Discover Credit Cards Accepted - No Surcharge. Cashiers Checks Welcomed. ©2014 by Midern Computer, Inc. All rights reserved. Ultrabook, Celeron, Celeron Inside, Core Inside, Intel, Intel Logo, Intel Atom, Intel Atom Inside, Intel Core, Intel Inside, Intel Inside Logo, Intel vPro, Itanium, Itanium Inside, Pentium, Pentium Inside, vPro Inside, Xeon, Xeon Phi, and Xeon Inside are trademarks of Intel Corporation in the U.S. and/or other countries. This PC is preloaded with trial version of Microsoft Office 2013. Purchase an Office 2013 Product Key to activate full version Office software. All company and/or product names mentioned herein are trademarks and/or registered trademarks of their respective companies. Prices and specifications are subject to change without notice. Opened software and shipping charges are non-refundable. 30-Day money back guarantee does not include freight or shipping and handling charge.

Call us toll-free at:
800.669.1624

For up-to-the-minute pricing and ordering information:
sagernotebook.com

NP 8652

- 4th Generation Intel® Core™ i7-4710HQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 15.6" QFHD LED Display (3840x2160) in Super Clear Glare Type Screen
- 4GB DDR5 NVIDIA® GeForce™ GTX 980M GPU with Optimus™ Technology
- 8GB Dual Channel DDR3-1600MHz Memory
- 750GB 7200RPM SATA II Hard Drive
- 2 Hard Drives + 2 M.2 SATA SSD Drives Capable with Raid 0, 1 Function
- Full sized Keyboard with LED backlight
- Integrated Wireless LAN 802.11b/g/n + Bluetooth Wireless Combo
- Built-in Card Reader and 2.0M FHD Video Camera
- Built-in Onkyo speakers
- Sound Blaster® X-Fi™ MB3 Sound System
- Slim design with only 28.8mm /1.13 inch thin
- Microsoft® Office 2013 Trial*

$1799

NP 8278-S

- 4th Generation Intel® Core™ i7-4710MQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 17.3" Full HD LED Display (1920x1080) with Matte Finished Screen
- 30 days No Dead Pixel Guaranteed Insurance
- 6GB DDR5 NVIDIA® GeForce™ GTX 970M GPU with Optimus™ Technology
- Optional NVIDIA® GeForce™ GTX 980M GPU
- 8GB Dual Channel DDR3-1600MHz Memory
- 120GB Crucial M500 mSATA III SSD
- 1TB 7200RPM SATA II Hard Drive
- 6X Blu-ray Reader / 8X DVD±R/2.4X +DL Super Multi Drive
- 2 Hard Drives + 2 mSATA SSD Drives Capable with Raid 0, 1 Function
- Full sized Keyboard with LED backlight
- Intel® Dual Band Wireless-AC 7260 Wireless LAN + Bluetooth Wireless Combo
- Built-in Card Reader, Fingerprint Reader and 2.0M FHD Video Camera
- Built-in Onkyo speakers with a sub-woofer
- Sound Blaster® X-Fi™ MB3 Sound System
- Microsoft® Office 2013 Trial*

$1599

AFTER $160
INSTANT SAVINGS!

NP 8268-S

- 4th Generation Intel® Core™ i7-4710MQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 15.6" Full HD LED Display (1920x1080) with Matte Finished Screen
- 30 days No Dead Pixel Guaranteed Insurance
- 6GB DDR5 NVIDIA® GeForce™ GTX 970M GPU with Optimus™ Technology
- Optional NVIDIA® GeForce™ GTX 980M GPU
- 8GB Dual Channel DDR3-1600MHz Memory
- 120GB Crucial M500 mSATA III SSD
- 750GB 7200RPM SATA II Hard Drive
- 8X DVD±R/RW/4X +DL Super Multi Drive
- One Hard Drive + 2 mSATA SSD Drives Capable with Raid 0,1 Function
- Full sized Keyboard with LED backlight
- Intel® Dualv Band Wireless-AC 7260 Wireless LAN + Bluetooth Wireless Combo
- Built-in Card Reader, Fingerprint Reader and 2.0M FHD Video Camera
- Built-in Onkyo speakers and a sub-woofer
- Microsoft® Office 2013 Trial*

$1499

AFTER $175
INSTANT SAVINGS!

NP 8651

- 4th Generation Intel® Core™ i7-4710HQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 15.6" Full HD LED Display (1920x1080) with Matte Finished Screen
- Optional 15.6" QFHD LED Display (3840x2160)
- 3GB DDR5 NVIDIA® GeForce™ GTX 970M GPU with Optimus™ Technology
- 8GB Dual Channel DDR3-1600MHz Memory
- 1TB 7200RPM SATA II Hard Drive
- 2 Hard Drives + 2 M.2 SATA SSD Drives Capable with Raid 0, 1 Function
- Full sized Keyboard with LED backlight
- Intel® Dual Band Wireless-AC 7260 Wireless LAN + Bluetooth Wireless Combo
- Built-in Card Reader and 2.0M FHD Video Camera
- Built-in Onkyo speakers
- Sound Blaster® X-Fi™ MB3 Sound System
- Slim design with only 25mm / 0.98 inch thin
- Microsoft® Office 2013 Trial*

$1399

NP 8268

- 4th Generation Intel® Core™ i7-4710MQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 15.6" Full HD LED Display (1920x1080) with Matte Finished Screen
- 3GB DDR5 NVIDIA® GeForce™ GTX 870M GPU with Optimus™ Technology
- 8GB Dual Channel DDR3-1600MHz Memory
- 1TB 7200RPM SATA II Hard Drive
- 8X DVD±R/RW/4X +DL Super Multi Drive
- One Hard Drive + 2 mSATA SSD Drives Capable with Raid 0, 1 Function
- Full sized Keyboard with LED backlight
- Integrated Wireless LAN 802.11b/g/n + Bluetooth Wireless Combo
- Built-in Card Reader, Fingerprint Reader and 2.0M FHD Video Camera
- Built-in Onkyo speakers with a sub-woofer
- Microsoft® Office 2013 Trial*

$1299

NP 7338

- 4th Generation Intel® Core™ i7-4710MQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 13.3" Full HD LED Display (1920x1080) with Wide Viewing Angle in Matte Finished Screen
- 2GB DDR5 NVIDIA® GeForce™ GTX 860M GPU with Optimus™ Technology
- 8GB Dual Channel DDR3-1600MHz Memory
- 120GB Crucial M500 mSATA III SSD
- 750GB 7200RPM SATA II Hard Drive
- 1 Hard Drive and 2 mSATA SSD Drives with Raid 1, 0 Function Capable
- Isolated Keyboard with LED backlight
- Integrated Wireless LAN 802.11b/g/n + Bluetooth Wireless Combo
- Built-in Card Reader and 2.0M HD Video Cam
- Sound Blaster™ Cinema Sound System
- Microsoft® Office 2013 Trial*

$1199

NP 7358

- 4th Generation Intel® Core™ i7-4710MQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 15.6" Full HD LED Display (1920x1080) with Matte Finished Screen
- Also available in 17.3" Full HD LED Display with model NP7378 (without Fingerprint Reader and Backlight Keyboard)
- 2GB DDR5 NVIDIA® GeForce™ GTX 860M GPU with Optimus™ Technology
- 8GB Dual Channel DDR3-1600MHz Memory
- 1TB 7200RPM SATA II Hard Drive
- 8X DVD±R/RW/4X +DL Super Multi Drive
- 2 Hard Drives with Raid 1, 0 Function + 1 mSATA SSD Drive Capable
- Isolated Keyboard with LED Backlight
- Integrated Wireless LAN 802.11b/g/n + Bluetooth Wireless Combo
- Sound Blaster™ Cinema Sound System
- Microsoft® Office 2013 Trial*

$1099

NP 6658

- 4th Generation Intel® Core™ i7-4710MQ Processor (6MB L3 Cache, 2.50GHz)
- Windows® 8.1 64-bit Edition
- 15.6" Full HD LED Display (1920x1080) in Super Clear Glare Type Screen
- Also available in 17.3" Full HD LED Display with model NP6678 (with Backlight Keyboard)
- 2GB DDR3 NVIDIA® GeForce™ GT 850M GPU with Optimus™ Technology
- 8GB Dual Channel DDR3-1600MHz Memory
- 750GB 7200RPM SATA II Hard Drive
- 8X DVD±R/RW/4X +DL Super Multi Drive
- 1 Hard Drive + 1 mSATA SSD Drive Capable
- Integrated Wireless LAN 802.11b/g/n + Bluetooth Wireless Combo
- Built-in Card Reader and 2.0M HD Video Camera
- Sound Blaster™ Cinema Sound System
- Microsoft® Office 2013 Trial*

$999

LG
M-DISC
CORSAIR
GEFORCE GTX

Sibling Rivalry

Six-core Haswell-E battles four-core Devil's Canyon

BY GORDON MAH UNG

We love, just love Intel's Samuel L. Jackson of CPUs: the Core i7-5960X. With its eight cores of benchmark kicking fu, it's the baddest mother in all of Englewood. But then we get to that needle-scratch stop of a price tag: $1,000.

No. For most of us, the true enthusiast CPU lives in the $300 to $400 price band. But what's the right choice? With Intel's excellent Core i7-4790K "Devil's Canyon" and its Core i7-5820K "Haswell-E Lite," the righteous path is not an easy one to take. To help you decide, we've constructed two PCs using Intel's not-quite-top procs for a sibling rivalry match not seen since Thor and Loki, Fredo and Michael Corleone, and Ron Burgundy and Wes Mantooth.

We then let them fight it out for the top bunk, the second helping of mashed potatoes, and who has to take a bath first. To find out the winner (and which should be in your next rig), read on.

CORE I7-4790K

Devil's Canyon

CAN INTEL'S QUAD-CORE QUASH ITS STELLAR NEW SIX-CORE SIBLING?

How badass a CPU is Intel's 4GHz Core i7-4790K? Well, it gets to have its own name. Devil's Canyon. In many ways, it's not really that different from other Haswell chips that have come before it. What Intel did was tweak the package to provide more stable voltage at high overclocks and a new thermal interface material to also aid overclocks (see, Intel loves you enthusiasts). The result was to supposedly make the most overclockable LGA1150 Haswell CPU evar! There were even hushed rumors of the chip hitting 5GHz overclocks using rusty old Pentium II coolers. That was the theory, anyway.

The reality is a chip that doesn't actually overclock that much further than the CPU it replaced: the 3.5GHz Core i7-4770K. Though disappointed, people have accepted this, and come to enjoy the Devil's Canyon CPU as a pretty good part for overclockers working in the LGA1150 platform. Where Core i7-4770K "binned" or fell into CPUs that would overclock from good parts at 4.7GHz to pure dogs at 4.3GHz, most Devil's Canyon chips give up overclocks more in the higher range. One way to look at it is that every Devil's Canyon is a "good part." Even better, they're priced the same as the chips they replaced, despite their higher base clocks.

> "Our task is to build a potential configuration to compare with Haswell-E.

Budget be gone

It's this chip that we based our first enthusiast-focused build on. We paired our $340 CPU with hardware we thought befitting of it. A solid midrange mobo in the form of the Gigabyte GA-Z97X-UD5H along with the new hot card in town: the GeForce GTX 980. Our early intentions were to leave open the doorway for a pair of GeForce GTX 980 cards in SLI, thus we paid more for the midrange board with SLI support and a PSU that would handle it.

To this we added an LG Blu-ray burner, 500GB Samsung 840 EVO, 3TB WD Caviar, NZXT Kraken X61 cooler, Enermax 730-watt PSU, and 16GB of Adata XPG2 DDR3/1866. All this went into a Corsair Obsidian 450D case. The sum total of our bill was $2,164.

INGREDIENTS

PART		PRICE
CPU	Intel Core i7-4790K	$340
Cooler	NZXT Kraken X61	$124
Mobo	Gigabyte GA-Z97X-UD5H	$175
RAM	16GB ADATA XPG V2 DDR3/1866	$145
GPU	Zotac GeForce GTX 980	$550
ODD	LG WH16NS40	$60
SSD	500GB Samsung 840 EVO	$269
HDD	3TB WD Caviar Green	$107
Case	Corsair Obsidian 450D	$120
PSU	Enermax Revolution XT 730	$125
Lights	BitFenix Alchemy Connect LED Strips	$50
OS	Win8.1	$99
Total		**$2,164**

intel
4th Gen
Intel® Core™ i7

The Devil's Canyon CPU didn't live up to early overclocking hopes, but remains a great chip.

Before you gasp at the prices, you should understand our exercise wasn't to build the cheapest enthusiast PC. It was to build a potential configuration to compare with Haswell-E. There were certainly ways to trim the budget. A cheaper motherboard, smaller SSD, lower-cost cooler, ditching the optical drive, and less-expensive case, first off. Hell, we spent $50 on the beautiful BitFenix Alchemy Connect LED strip lights. We just think it adds to the overall ambience of our big-windowed 450D. This is, frankly, a very nice machine capable of doing everything an enthusiast wants. It offers gaming at 1080p resolutions at maximum settings and even 2560x1440 gaming with most games at their max settings. It's a really great, well-balanced, luxurious machine for the money.

Overclocking on

With our X61 cooler and Devil's Canyon chip, we weren't going to let it go without overclocking, so we tuned our chip up with a nice moderate overclock of 4.5GHz on all cores. We think 4.6GHz to 4.7GHz were obtainable, but a solid all-core 4.5GHz clock is probably more representative of the part's abilities that everyone will push for.

GET
CHARGED
UP
SHOW AT 10. C U THERE?
YEAH! SO PUMPED!
ITS GONNA ROCK!!
SS

With USB, you can do it all.

USB inspires confidence as the most widely-accepted, reliable form of connectivity out there. Delivering effortless charging, video streaming, music and photos to your home, office, car and anywhere in between. www.usb.org.

SUPERSPEED+ CERTIFIED USB 10Gbps

Message brought to you by USB Implementers Forum

SCAN

Check out the latest SuperSpeed USB 10 Gbps (USB 3.1) info here:

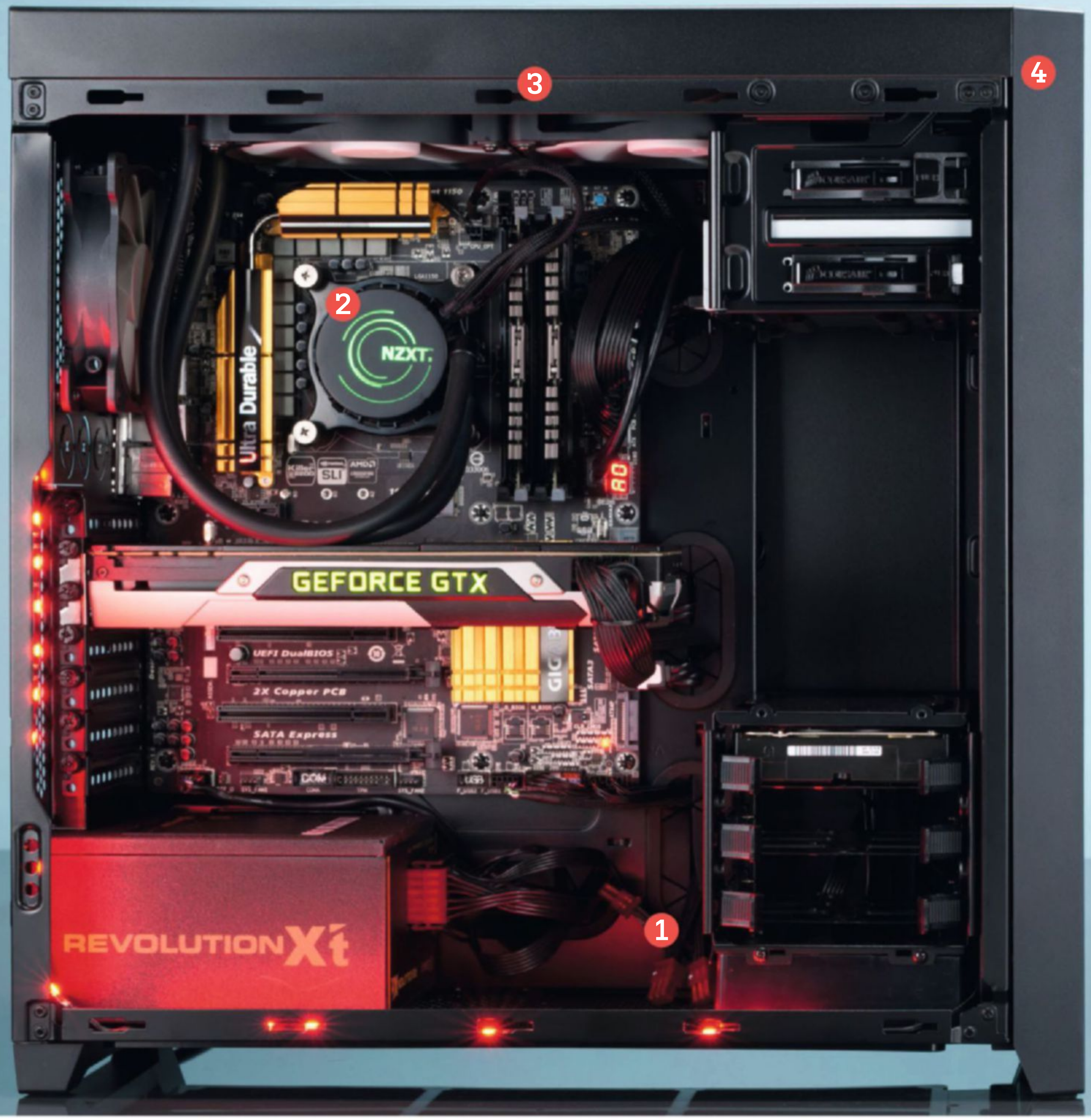
1 We so wanted SLI on our box that we even pre-wired the PC for it. All you need to do is grab a second GeForce GTX 980, screw it down, attach the wires, and plug in the SLI bridge.

2 We did a moderate overclock on our Core i7-4790K part to 4.5GHz on all cores under load, but it's really just 200MHz shy of what even the most aggressive overclocks people are seeing with this LGA1150 part.

3 The Kraken X61 gives us all the cooling we need for our overclock, but to maintain good temps, we decided to set the cooler to an 80 percent manual load. That's a gentle hum, not a roar from the fans. And yes, you can program the LED controller, too!

4 Despite its size, the Corsair Obsidian 450D lets you pack an impressive amount of hardware inside for a compact mid-tower design. Its open front bezel also favors fairly aggressive airflow, too.

> “It's a really great, well-balanced, and luxurious machine for the money.



MASTER YOUR BATTLEFIELD.

TYON
ROCCAT

THE TYON´S X-CELERATOR
is an innovative, two-way analog stick.

GAMING HAS CHANGED, THE BATTLEFIELD HAS EVOLVED

The X-Celerator analog thumb paddle's amazing control configurations, ingenious placement of the Fin Switch, a deadly precise 8200 R3 Laser Sensor, ROCCAT's powerful driver, 16 buttons, 31 assignable functions and a vivid 2 way lighting system with 16.8 million colors – the ROCCAT Tyon Gaming Mouse takes gamers to the pinnacle.

ROCCAT™ TYON

BEST BUY

NOW AVAILABLE AT BEST BUY

CORE I7-5820K

Haswell-E "Lite"

BEHOLD THE NEW ENTHUSIAST STANDARD BUILD

Yes, it's a nerdworld problem, but it's a good problem to have. Do you pony up for the Devil's Canyon LGA1150 CPU or pay more for the new LGA2011-V3 chip, the Core i7-5820K part? These are the contests we live for, despite all the soul-searching they cause when it's time to build a new machine.

For our build, we decided to essentially mirror our Devil's Canyon rig. They do, after-all, share the same DNA, right? We did make a few tucks and changes worthy of its higher status, though. The most obvious is the Corsair Obsidian 750D case, which is larger and roomier than the Obsidian 450D for just $30 more. Sure, we could have crammed this same hardware into another Obsidian 450D, but after building into the Devil's Canyon rig (it went first since it's older), we realized how much we enjoy a case that's just a little bit bigger. It simply makes everything easier.

For the most part, we used the same components so as not to impact performance too much. There's the same 500GB Samsung EVO SSD, an identical GeForce GTX 980, and the same LG Blu-ray BDXL burner, too. Like our Devil's Canyon box, we reached for the NZXT Kraken X61 cooler, too. Since our intentions were to overclock both boxes, we didn't want either one to have an advantage with cooling. Sure, you might argue about air-flow differences between the cases, but with the temperatures the GeForce GTX 980 produces, its impact should be minimal.

Mixing it up

Where we did have to vary was in the motherboard and RAM. That's because the LGA2011-V3 is simply a different socket. RAM was also dictated to be different because the Core i7-5820K uses DDR4. For the mobo, we tapped a Gigabyte GA-X99-UD4. Yes, there are marginally cheaper boards but for $250, the GA-X99-UD4 hits all the high notes with its support for M.2, SATA Express, separated audio paths, and four-way SLI and CrossFire support. This last point, we should add, is a bit of a fake-out, though. If you do truly intend to run four GPUs, you'll lose access to the USB 3.0 header. We can't blame Gigabyte too much for it though, as we think the USB 3.0 plugs in general are poorly designed. Why they have to be so damned large and stiff we just don't know. For RAM, we went with 16GB of Corsair LPX DDR4/2666. It's certainly not the cheapest by a long shot, but something really bugged us about building a box at this price range and still having RAM without heat spreaders.

> "USB 3.0 plugs are designed poorly. Why are they so damned large and stiff?

intel
Core™ i7
R3

Haswell-E uses DDR4, meaning our second build demanded more advanced RAM.

Our PSU choice was the same Enermax Revolution XT 730. It's gold-rated, single-rail, and a "hybrid" modular design. That means some of the cables are hardwired and some are modular. You'll get different opinions on modular versus non-modular at *Maximum PC*, but not all of us believe in modular designs. At 730 watts, it's enough power to run this machine, even overclocked, all day and night with the GeForce GTX 980 card. Believe it or not, it's also enough power to run two GTX 980 cards without a hitch.

As with our Devil's Canyon box, we added case lighting using a pair of 30cm BitFenix Alchemy Connect LED strips. With its big case windows, lighting was a must have. Sorry haters. It just look right.

INGREDIENTS

PART		PRICE
CPU	Core i7-5820K	$390
Cooler	NZXT Kraken X61	$124
Mobo	Gigabyte GA-X99-UD4	$250
RAM	16GB Corsair Vengeance LPX DDR4/2666	$320
GPU	Zotac GeForce GTX 980	$550
ODD	LG WH16NS40	$60
SSD	500GB Samsung 840 EVO	$269
HDD	3TB WD Caviar Green	$107
Case	Corsair Obsidian 750D	$150
PSU	Enermax Revolution XT 730	$125
Lights	BitFenix Alchemy Connect LED Strips	$50
OS	Win8.1	$99
Total		**$2,494**

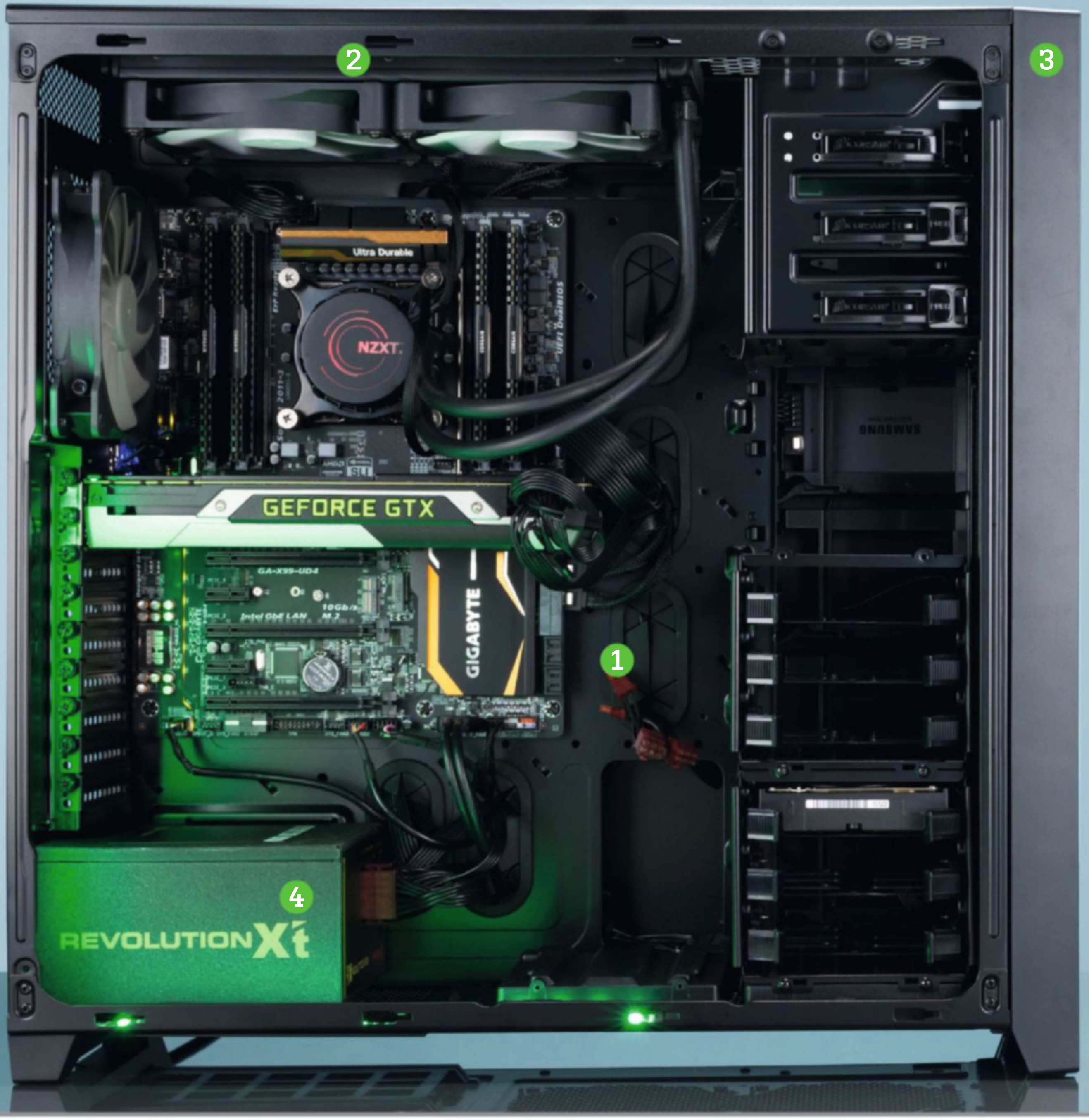
1 One of our biggest problems with modular PSUs is misplacing the plug-in cables. To prevent such a pain on this build, we pre-wired it for a second GeForce GTX 980. All you have to do is drop the card in and plug it in.

2 We set the Kraken X61 to a manual 85 percent load to enable our overclocking. Thanks to the Kraken's larger 140mm fans, the acoustics were acceptable considering how much performance we're getting out of this rig.

3 The Corsair Obsidian 750D is bigger than the Obsidian 450D, so building in this box was quite a bit more pleasant than the smaller and tighter case used for the Devil's Canyon build.

4 With a 100 percent load on our system barely breaking 300 watts, the 730-watt Enermax Revolution XT PSU is more than enough to keep it all running, even through hot summers.

> “We realized how much we enjoy a case that's just a little bit bigger.



PERFORMANCE

Where the Rubber Meets the Road

OC'ING AND BENCHMARKING THE RIGS

We thought about running all of our standard benchmark tests using stock clocks, but realistically, is anyone going through the expense of paying for unlocked CPUs and a closed-loop cooler to not overclock?

No. So we decided that to be realistic, we'd overclock these boxes. For our Devil's Canyon rig (aka Core i7-4790K) we went with a pretty basic overclock to 4.5GHz across all cores using a 1.275 core voltage on the CPU with thread-light loads reaching 4.7GHz. We considered pushing the chip harder to 4.7GHz across all cores but decided 4.5GHz is a better representative of what everyone can hit with the chip.

Old meets new

For our Core i7-5820K part, we overclocked all six cores to 4.4GHz using a straight turbo boost overclock. We also dialed up loads on two cores or less to 4.6GHz. To do this, we had to goose the CPU's core voltage to 1.296 volts to see stability. It's certainly easier to hit more stable overclocks with Devil's Canyon. We had the quad-core dialed in and crunching benchmarks before our Core i7-5820K part was up and running overclocked.

Our zero-point system is an older six-core Sandy Bridge-E Core i7-3930K with a mild overclock from stock 3.2GHz to 3.8GHz. Its graphics card is a GeForce GTX 690, which is essentially two GeForce GTX 680s on a single card. Although elderly, it's the perfect foil here, as many people driving the 3-year-old Core i7-3930K chips are probably looking for an upgrade.

Against our zero point, the Core i7-4790K chip gives up what we expect. In workloads that aren't thread-heavy, such as ProShow Producer 5.0 and Stitch.Efx 2.0, the quad-core offers a noticeable performance difference of 20 percent or more. When you get to workloads that can use those spare cores though, even an old Core i7-3930K with a fairly mild clock speed can still win. That's what we saw in our Premiere Pro CS6 test, where the Core i7-4790K was roughly 9 percent slower than the Core i7-3930K part.

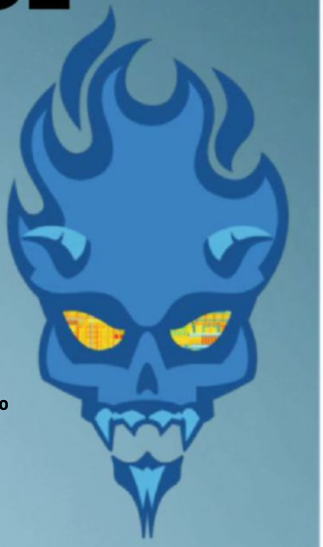
The basic lesson still holds that sometimes there's no replacement for displacement and frequency can't always trump cores. Still, that new Haswell microarchitecture that's two generations newer than Sandy Bridge can still cook. In x264 HD 5.0, also heavily dependent on CPU cores, the Core i7-4790K trails by only about 4 percent.

> "What happens when you give it two cores at the cost of clock speed? Cores win.

BENCHMARKS

	Core i7-3930K (Zero-Point "Sandy Bridge-E")	**Core i7-4790K ("Devil's Canyon")**	**Core i7-5820K ("Haswell-E Lite")**
Tested Clock Speed	3.8GHz	4.5–4.7GHz	4.4–4.6GHz
Premiere Pro CS6 (sec)	2,000	2,193	**1,580**
Stitch.Efx 2.0 (sec)	831	**698**	711
ProShow Producer 5.0 (sec)	1,446	**1,176**	1,184
x264 HD 5.0 (fps)	21.1	20.2	**27.3**
Batman: Arkham City (fps)	**76**	75	72
3DMark 11	**5,847**	5,793	5,706

Best scores are bolded.



No fair! How come Devil's Canyon gets its own groovy logo, while Haswell-E has to wear the same-old company standard?

But the real battle here is between Core i7-5820K and Core i7-4790K. What happens when you take the same microarchitecture and give it two more cores at the cost of some clock speed? The cores win.

Working the cores

Where the six-core chip really takes the lead is no surprise: thread-heavy tasks. We saw the Core i7-5820K come in almost 40 percent faster. A crushing difference. But what about those single-threaded and lightly threaded workloads? That's where it's too close for comfort. Because we ran our Devil's Canyon slightly faster with its 4.7GHz–4.5GHz, it's pretty much meh. In Stitch.Efx and ProShow Producer, the spread was basically 1 percent to 2 percent. Game loads were also almost a tie, with a very slight edge going to the Core i7-4790K part.

Since power consumption also matters, we hooked up both machines to a watt meter. The Core i7-4790K used about 296 watts under a GPU load, 270 and 232 under a CPU load. The Core i7-5820K added a little to that with 311 watts consumed at the wall under GPU, and 270 under a worst-case CPU load. In idle, both boxes used roughly 70 watts.

If we had to call a winner on performance, it would clearly be the newer, faster Core i7-5820K "Haswell-E Lite." It pummels its sibling in multithreaded loads and really doesn't give up anything significant in gaming and tasks that don't use all cores. Basically, it's doesn't matter if Bobby went to Cal Tech and married a lawyer because, well, Greg went to MIT and married a surgeon.

"The Perfect PC"
- Forbes
Tiki
GODLIKE POWER
MICRO-TOWER
www.falconnorthwest.com

Weighing up the Differences

WHICH CHIP TO CHOP?

If you're a "mature" person, you already know this technique, but for a young nerdling, this might be new. Nerd junior, at some point in your life, you will likely need to sit down and make two columns weighing the pluses and minuses of your girlfriend or boyfriend, your job, your Italian-made car, and your PC parts in order to decide whether to fish or cut bait. So here goes…

CORE I7-4790K

"Devil's Canyon"

- ⊞ Cheaper to buy and build with, thanks to lower-cost motherboards and RAM.
- ⊟ Only 16 PCIe 3.0 lanes.
- ⊞ Gamers and most people really don't need any more than four cores with Hyper-Threading.
- ⊟ Chipset doesn't have as many SATA 6 ports. Faster M.2 configurations steals from GPU bandwidth.
- ⊞ Uses a little less power when under heavy loads.
- ⊟ LGA1150 won't see any new CPU support beyond Broadwell early next year.
- ⊞ More motherboard varieties and supports M-ITX.
- ⊟ Maxes out at 32GB.

CORE I7-5820K

"Hawell-E"

- ⊟ Why no 40 lanes of PCIe 3.0 Intel?
- ⊞ Six cores have never been so cheap.
- ⊟ More expensive CPU, mobo, and RAM.
- ⊞ Massacres quad-cores in thread-intensive workloads.
- ⊟ Few games and applications actually require six cores.
- ⊞ Socket could possibly see two CPU upgrades in Broadwell-E and Skylake-E.
- ⊟ Puts out more heat than quad-core when overclocked, and uses more power.
- ⊞ Quad-channel DDR4 can run 64GB today with 128GB down the road.
- ⊟ Still fairly slim pickings on motherboard selection.
- ⊞ More PCIe 3.0 lanes than the best Haswell chips.
- ⊟ No Mini ITX configurations.

It's crunchtime. Are you a six-shooter or with the fantastic four?

The Upshot WHAT WE'D BUILD…

What part we'd recommend depends on what kind of enthusiast you are and how you approach things. If you're all about performance, and push thread-heavy loads or multitask like mad with intensive applications—like encoding a video while running Photoshop—the answer is easy. Reach for the six-core Core i7-5820K.

It may be pricier to build with but when you consider it has always cost $580 to buy the Intel six-core processor, then $380 for the Core i7-5820K is almost a deal. That it performs just about as fast as the Core i7-4790K should seal the deal for those who want reasonably priced performance without compromise.

That's not the end of the story, though. The price difference between the systems in the parts that mattered the most—RAM and mobo—was $292. Sure, we could have shaved off some on the motherboard or RAM for the Core i7-5820K but we could have done the same for the Core i7-4790K box, too. The overall performance of the Core i7-5820K is awesome. But for $292, you could almost add a second GeForce GTX 980. If the box was built using a cheaper GPU, such as the GeForce GTX 970, two GPUs with money left over would be attainable. If you're a 75 percent gamer with only some content-creation duties, the Core i7-4790K is the better choice.

The answer, in other words, is just what your parents told you growing up. We're just as proud of you as we are of your brother, even if he takes a helicopter to his summer house in Grenyarnia.

SAMSUNG
One Giant Leap Forward
SAMSUNG
Solid State Drive

SAMSUNG
Solid State Drive

The World’s First 3D V-NAND SSD From Samsung

Go where no SSD has gone before with the SSD 850 PRO. Its unique 3D V-NAND technology gives it exceptional performance, with class-leading* 150 Terabytes Written (TBW) lifetime endurance backed by a 10-year warranty.

*Based only on consumer-class SSDs

© 2014 Samsung Electronics America, Inc. Samsung is a registered trademark of Samsung Electronics Co., Ltd.

SETTING A **HIGHER** STANDARD

ALL GENESIS AND MILLENNIUM FEATURE

Variable Mounting

VIDEO CARD 1
VIDEO CARD 2
VIDEO CARD 3
VIDEO CARD 4

Standard

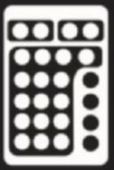
90°

Inverted

90° Inverted

Professionally Sleeved Cables

FROSTBYTE Liquid-Cooling



Built-In LED Lighting

INCLUDED IN ALL SYSTEMS

Over 10,000 Custom Options | Name-Brand Components Only

FREE Lifetime 24/7 Service & Support

*© 2014 ORIGIN PC Corporation all rights reserved. ORIGIN and the ORIGIN "O" Symbol are trademarks of ORIGIN PC Corporation. All other trademarks are property of their respective owners

“Record-setting benchmark performance”
-Maximum PC

GENESIS
MILLENNIUM
CHRONOS
EVO 15-S
EON
ORIGIN
LED REMOTE CONTROL

ORIGIN PC Elite Gaming Peripherals

Powered by Razer

Award Winning

MAXIMUM PC
KICK ASS!
PC GAMER
EDITOR'S CHOICE
★★★★★

Customize Your Power

ORIGINPC.COM

Online Financing Available!

ORIGIN
HIGH-PERFORMANCE PCS

Follow us @

MIGHTY MAX

GTX 980
NVIDIA

XWELL

Say hello to Nvidia's new performance graphics chips, the GeForce GTX 980 and 970. We think you'll approve

BY TOM MCNAMARA

Sometimes, things don't go according to plan. Both AMD and Nvidia were supposed to have shifted to 20nm graphics chips by now. In theory, that gets you lower temperatures, higher clock speeds, and less noise. Instead, the Taiwanese company that actually manufactures most of AMD and Nvidia's GPUs has been struggling to get its 20nm technology rolling. The result? The whole PC graphics industry remains stuck at 28nm.

That single fact explains an awful lot about Nvidia's latest high performance graphics chip, codenamed GM204, and the Maxwell architecture that underpins it. The GM204 chip is not a direct successor to the GTX 780, which has more transistors, texture mapping units, and that 3D rendering jazz. It's actually the next step beyond the GTX 680, aka GK104, which was launched way back in March 2012. And yes, GK104 was a 28nm chip, too.

What's really impressive is that despite all that, our testing indicates the fastest version of GM204—the new GeForce GTX 980—is meaningfully quicker than the GTX 780 and 780 Ti. It's usually quicker than AMD's Radeon R9 290 and 290X as well, though there are a couple of games that are better optimized for Radeon hardware. So yup, we've a new single-GPU performance king from Nvidia despite the limitations of the 28nm process. If that's not impressive enough, Nvidia has also managed to create one of the most power-efficient graphics chips ever seen. Time to find out how.

NVIDIA'S MEAN 28NM MACHINE

Maxwell ups Nvidia's ante while we wait for 20nm

When 20nm processes become available sometime in 2015, we'll probably see the actual successor to the GTX 780. But the GTX 980 is here right now, and comes in at $500. That seems high when you consider this isn't the fastest GPU that will come out of Nvidia's new Maxwell family.

But remember, the GTX 680 launched at this price and wasn't the best of the Kepler chips. And keep in mind the GTX 980 is simply faster than the 780 and 780 Ti, which currently cost more. (As we wrote this, AMD announced it was dropping the base price of the R9 290X from $500 to $450, so that war rages on.) However, if the GTX 980 looks like decent value, the GTX 970 at $329 is a spectacular deal. More on that in a moment.

Price wars

In other news, Nvidia told us they were dropping the price of the GTX 760 to $219, and the GTX 780 Ti, 780, and 770 are being officially discontinued. So if you need a second one of those for SLI, now is a good time to invest.

Take a look at the key numbers below. The 980 and 970 don't look like much of a jump from the 680. In fact, the 980 has only 128 shaders (aka "CUDA cores") per streaming multiprocessor (SM). Performance tends to increase with a higher number of shaders per SM, so how does the 980 GTX perform so well, despite having a worse ratio? Well, Nvidia claims it has improved the performance of each CUDA core by 40 percent. If that calculation is accurate, the GTX 980 effectively has about as many CUDA cores as a 780 Ti. Add the GTX 980's higher clock speeds, and performance should be better.

You probably also noticed the 970's unusually low price. In comparison, The GTX 670 launched at $400 in May 2012, and the GTX 570 launched at $350 in December 2010. But those two earlier cards were closer in spec to their bigger brothers. For example, the GTX 570 had 480 CUDA cores, while the 580 had 512 cores. That's a difference of just 6.25 percent, although the memory bus was reduced from 384-bits to 320-bits. In contrast, the 970 gets nearly 20 percent fewer CUDA cores than the 980, though its memory bus remains unchanged.

Nvidia also says the official boost clock on these new Maxwell cards is not set in stone. We witnessed our cards boosting up to 1,253MHz for extended periods of time (20 seconds here, 30 seconds there). When the cards hit their thermal limit of 80 C, they would fall down as low as 1,165Mhz, but we never saw them throttle below the official base of 1,126MHz. In SLI, we also noted the upper card would go up to 84 C. These cards have an upper boundary of 95 C, says Nvidia, when they'll throttle below the base clock to avoid going up in smoke. We weren't inclined to test that theory, for now.

You may also spot these new high-end cards stick with modest 256-bit memory buses. Could that be an issue in this age of 4K monitors and massive pixel grids? Perhaps. But Nvidia says its delta color compression (DCC) algorithms have improved bandwidth efficiency by about 25 percent on average (it varies between games). Since DCC directly impacts pixels, this effect should scale with your resolution, becoming increasingly helpful as you crank your res higher.

Twist and shout

You can also combine these gains with Nvidia's new Multi-Frame Sampled Anti-Aliasing (MFAA). This technique rotates a pixel's sampling points from one frame to the next, so that two of these points can simulate the visual results of four sampling points whose locations remain static. The effect starts to shimmer at about 20fps, whereupon it's automatically disabled. But when running well, Nvidia claims it can be 30 percent faster, on average, than the visually equivalent level of Multi-Sample Anti-Aliasing (MSAA). Like TXAA (Temporal Anti-Aliasing), it won't be available on AMD cards (or if it is, it will be built by AMD and called something else).

Unfortunately, MFAA was not available in the version 344.07 beta drivers given to us, but Nvidia says it will be in the driver after this one. This means the package will not be complete on launch day. Support will trickle

SPECIFICATIONS

	GTX 980	GTX 970	GTX 680	GTX 780	GTX 780 Ti	R9 290X
Generation	GM204	GM204	GK104	GK110	GK110	Hawaii
Core Clock (MHz)	1,126	1,050	1,006	863	876	"Up to" 1GHz
Boost Clock (MHz)	1,216	1,178	1,058	900	928	N/A
VRAM Clock (MHz)	7,000	7,000	6,000	6,000	7,000	5,000
VRAM Amount	4GB	4GB	2GB/4GB	3GB/6GB	3GB	4GB
Bus	256-bit	256-bit	256-bit	384-bit	384-bit	512-bit
ROPs	64	64	32	48	48	64
TMUs	128	104	128	192	240	176
Shaders	2,048	1,664	1,536	2,304	2,880	2,816
SMs	16	13	8	12	15	N/A
TDP (watts)	165	145	195	250	250	290
Launch Price	$549	$329	$499	$649	$699	$549

GTX 980
nVIDIA

Per-shader performance has been improved by 40 percent, claims Nvidia.

> If the GTX 980 looks like decent value, the GTX 970 at $329 is a spectacular deal.

down to the older Kepler cards later on. Nvidia hasn't been specific about times, but it sounds like the 750 and 750 Ti (also technically Maxwell cards) will not join this party.

Light fantastic

Another major upgrade is Voxel Global Illumination, or VXGI. Nvidia positions this as the next step beyond ambient occlusion. With VXGI, light bounces off of surfaces, in real time, to illuminate nooks and crannies that would otherwise not be realistically lit. Ordinarily, light doesn't bounce around in a 3D game engine like it does in meatspace. It simply hits a surface and illuminates it. Sometimes the effect is just painted on. So there's a lot more calculation with VXGI.

But Nvidia has not made specific performance claims because the effect is highly scalable. A developer can choose how many cones of light they want to use and the degree of bounced light resolution, so Nvidia balances this result against a performance target. Since this is something that has to be coded into the game engine, we won't see it right away by forcing it in the drivers, like Nvidia users can with ambient occlusion.

Next is Dynamic Super Resolution (in the 344.11 drivers released recently, so we'll be giving it a peek soon). This combines super sampling with a custom filter. Super sampling takes a higher resolution than your monitor can display and squishes it down. It's a popular form of antialiasing, but the performance hit is steep. The 13-tap Gaussian filter that the card lays on top can further smooth out jaggies. It's a post-process effect that's thankfully very light, and you can also scale DSR down from 3840x2160 to 2560x1440. It's our understanding that, for now, it's only available with the 980 and 970.

Double vision

Nvidia is also investing more deeply in VR headsets with an initiative called VR Direct. Its main aim is a reduction in average latency from 50ms to 25ms, using a combination of code optimization, MFAA, and another new feature called Auto Asynchronous Warp (AAW). This displays frames at 60fps even when performance drops below that. Since each eye is getting an independently rendered scene, your PC effectively needs to maintain 120fps, which isn't going to be easy with more demanding games. AAW takes care of the difference. However, we haven't had the opportunity to test the GTX 980 with VR-enabled games yet.

Speaking of which, Nvidia is also introducing another new feature called Auto Stereo. As its name implies, it forces stereoscopic rendering in games that were not built with VR headsets in mind. We look forward to testing VR Direct at a later date.

GAME ADVANCED.

Falcon Northwest PCs powered by NVIDIA® GeForce® GTX™ Maxwell™ GPUs

Mach V
FragBox
DRX

Falcon Northwest
www.falconnorthwest.com

NVIDIA GEFORCE® GTX

BENCHMARKING THE BEAST

Mixed results mean questions remain over the GTX 980's launch price

2.5K (2560x1600) BENCHMARKS

	GTX 980	GTX 680	GTX 780	GTX 780 Ti	R9 290X
Tomb Raider	**33**	19	25	27	26
Metro: Last Light	**46**	21	22	32	30
Batman: Arkham Origins	75	51	65	**78**	65
Hitman: Absolution	42	27	40	45	**50**
Unigine Valley	45	30	43	**48**	41
Unigine Heaven	39	64	35	**39**	34
3DMark Fire Strike	**11,490**	6,719	8,482	9,976	9,837

Best scores are bolded. *Hitman* on "Ultra", *Fire Strike* at 1080p. TressFX enabled in *Tomb Raider*, PhysX in *Metro*.

4K (3840x2160) BENCHMARKS

	GTX 980	GTX 680	GTX 780	GTX 780 Ti	R9 290X
Tomb Raider	16	8.7*	26	28	28
Metro: Last Light	36	12	18	19	18
Batman: Arkham Origins	35	25	33	38	38
Hitman: Absolution	20	15	20	24	28
Unigine Valley	19	15	30	30	26
Unigine Heaven	19	11	23	23	18

Best scores are bolded. *TressFX disabled.

We tested the GTX 980 in two-way SLI and by itself, at 2560x1600 and 3820x2160, comparing it to roughly equivalent cards. Let's take a look at our results, customarily using the highest preset provided by each game, at 2560x1600 with 4xMSAA.

Put simply, the 980 delivers, especially given its pricing. It's not leapfrogging the 780 and 780 Ti, but Nvidia indicates it's not supposed to. It dominates the GTX 680, but that card is discontinued. The R9 290X, meanwhile, is hitting $430, while the not-much-slower 290 can be had for just $340. And you can pick up a 780 Ti for $560. So the 980's launch price is going to be a hurdle.

Performance in *Metro* has vastly improved, but *Hitman* in particular doesn't appear to favor the Green Team. Loyal Radeon fans probably won't be swayed.

While a solo 980 is already a respectable competitor, its success is more pronounced when we add a second card—as is the gap between it and the 780 Ti. It still continues to best the GTX 780, getting us over 60fps in each game with all visual effects cranked up. It also looks like Nvidia's claim of 40 percent improved CUDA core performance may not be happening consistently.

Is 4K too far?

So, what happens when we scale up to 3840x2160, also known as "4K", when we have four times as many pixels as 1080p? Can the GTX 980's 256-bit bus handle this much bandwidth? It still scales well, but the 384-bit 780 and 780 Ti are clearly scaling better, as is the 512-bit 290X.

As for power consumption, with a TDP of just 165W, a respectable 650-watt power supply should have no trouble powering two 980 GTXs. Meanwhile, the 290-watt R9 290X really needs at least a nice 850-watt unit to have some breathing room.

Overall, we still need to do some testing with VR to get a full picture. But as it stands, the 980 is another impressive showing for Nvidia. However, its 4K scaling isn't as good as we'd like, especially considering Dynamic Super Resolution. If you want to play at that level, it looks like the 290 and 290X are better choices, price-wise, while the overall performance crown at 4K still belongs to the 780 and 780 Ti. But considering the price difference between the 980 and the 780, its similar performance is commendable.

For 2560x1600 or lower resolutions, the 980 GTX emerges as a compelling option, but we're not convinced it's over $100 better than a 290X. Then again, you have MFAA, DSR, and VR Direct (plus the overall GeForce Experience package that's a bit slicker than AMD's Gaming Evolved). That might work for some people, or for Nvidia loyalists who've been waiting for an upgrade from their 680 but don't want to spend what's been asked for a 780 or 780 Ti.

HERE'S THE SYSTEM WE'VE BEEN USING FOR ALL OF OUR RECENT GPU BENCHMARKS:

Part	Component
CPU	Intel Core i7-3960X (at stock clock speeds; 3.3GHz base, 3.9GHz turbo)
CPU Cooler	Corsair Hydro Series H100
Mobo	Asus Rampage IV Extreme
RAM	4x 4GB G.Skill Ripjaws X, 2,133MHz CL9
Power Supply	Thermaltake Toughpower Grand (1,050 watts)
SSD	1TB Crucial M550
OS	Windows 8.1 Update 1
Case	NZXT Phantom 530

CyberPower recommends Windows

AMD

AMD RADEON GRAPHICS

AMD FX UNLOCKED

AMD A SERIES

Unlock the world's first 8-core desktop CPU.
Oh wait, we already did. Get 8-Cores in your System

CYBERPOWERPC

CREATE THE PC

OF YOUR Dreams

Gamer Scorpius 8000

Windows 8.1

GIGABYTE® GA970A-D3 AMD 970A USB 3.0 & SATA III
CORSAIR® 8GB DDR3 1600Mhz Dual Channel Memory
2TB SATA III 7200 RPM HD 32MB Cache
AMD Radeon™ R9 270 2GB Direct X 11 Video
Zalman Gaming Headset
Thermaltake Urban S21 Tower Case 430Watt 80+ Power
Asetek Liquid Cooling System

AMD FX-9590	$ 939
AMD FX-9370	$ 855
AMD FX-8350	$ 845
AMD FX-8320	$ 775
AMD FX-6300	$ 765
AMD FX-4350	$ 745

DVD 24X±RW · AMD 7.1 600 W · CoolerMaster® Keyboard · CoolerMaster® Optical Mouse · FREE Liquid Cooling

From **$745**

Gamer Scorpius 9000

Windows 8.1

GIGABYTE® AMD FX990 USB 3.0 & SATA III
CORSAIR® 16GB DDR3 1600Mhz Dual Channel Memory
2TB SATA III HDD 7200RPM 64MB Cache
AMD Radeon™ R9 280 3GB Direct X 11 Video
Zalman Gaming Headset
NZXT Source 530 Full Tower with 600Watt 80+ Power
Asetek Liquid Cooling System

AMD FX-9590	$ 1255
AMD FX-9370	$ 1169
AMD FX-8350	$ 1155
AMD FX-8320	$ 1089
AMD FX-6300	$ 1059
AMD FX-4350	$ 1045

14X Combo · AMD 7.1 600 W · CoolerMaster® Keyboard · CoolerMaster® Optical Mouse · FREE Liquid Cooling

From **$1069**

Zeus Mini-A100

Windows 8.1

AMD A88 Chipset MB USB 3.0 and SATA III
CORSAIR® 8GB DDR3 1600 Mhz Dual Channel Memory
500GB SATA III 6.0 7200 RPM HD 32MB Cache
AMD Radeon™ R7 Series Graphic Onboard
Zalman Gaming Headset
CyberpowerPC Zeus Mini-ITX Gaming Case 350Watt

AMD A10-7850K	$ 599
AMD A10-7700K	$ 579
AMD A10-6800K	$ 585
AMD A10-6700	$ 559
AMD A8-6600K	$ 549
AMD A8-6400K	$ 499

AMD 7.1 600 W · CoolerMaster® Keyboard · CoolerMaster® Optical Mouse

From **$499**

FangBOOK EVO AX7 100

AMD Quad-Core A10-5750M Processor
Windows 8.1
AMD A76M FCH Chipset
17.3 " Full HD Display 1920 X 1080
8GB DDR3 1600MHz Memory
1TB SATA300 Hard Drive
AMD Radeon™ HD 8970M 2GB Direct X 11 Video Card
Killer E2200 10/100/1000 Mbps Network Card
802.11 B/G/N Wireless Network

HDMI
IEEE 1394
3 x UBS 3.0
7.9 Lb.
4 in 1 Media Reader

DVD 8X±RW · 2 hr · Built-in

AMD A10-5750M **$1159**

www.cyberpowerpc.com 800 707 0393 730 Baldwin Park Blvd., City of Industry, CA 91746

All Desktop systems come with 3 year Limited Warranty + lifetime toll free techsupport

AMD, the AMD Arrow logo, AMD Phenom™ II, AMD Phenom™ ATI Radeon™ Graphics, 790 Series, and combinations thereof are trademarks of Advanced Micro Devices, Inc. All prices are subject to change without notice or obligation. Cyberpower is not responsible for any typographical and photographic errors. Copyright ©2013 Cyberpower. All rights reserved. NVIDIA®, nForce®, GeForce®, SLI™ are trademarks or registered trademarks of NVIDIA Corporation or its subsidiaries in the United States and other countries. CyberPower PCs use genuine Microsoft® Windows® • www.microsoft. com/piracy/howtotell

Work easy, play hard Windows 8

SLI vs. CROSSFIRE

Maxwell shows its class with PhysX

What about SLI and Crossfire multi-GPU rendering? All our tests are still conducted at 4xMSAA, which is total overkill at 4K, but we want to see just how hard we can push these cards.

The raw memory bandwidth of the 780, 780 Ti, and 290X certainly come in handy, despite the optimizations of Maxwell CUDA cores. That *Metro: Last Light* score remains pretty interesting. It's the only one we run with PhysX enabled (to balance out using TressFX in *Tomb Raider*). It really does look like Maxwell is much better at PhysX than any other GPU before it. That tech isn't quite common enough to change the game. But if the difference is as good as our testing indicates, more developers may pick it up.

Even a blisteringly fast card can be brought down by high noise levels or prodigious heat. Thankfully, this reference cooler is up to the task. Keep in mind that this card draws up to 165 watts, and its cooler is designed to handle cards that go up to 250W. But even with the fan spinning up to nearly 3,000rpm, it's not unpleasant. With the case side panels on, you can still hear the fan going like crazy, but we didn't find it distracting. These acoustics only happened in SLI, by the way. Without the primary card sucking in hot air from the card right below it, its fan behaved much more quietly. The GTX 980's cooling is nothing like the reference design of the Radeon R9 290 or 290X.

2.5K (2560x1600) BENCHMARKS

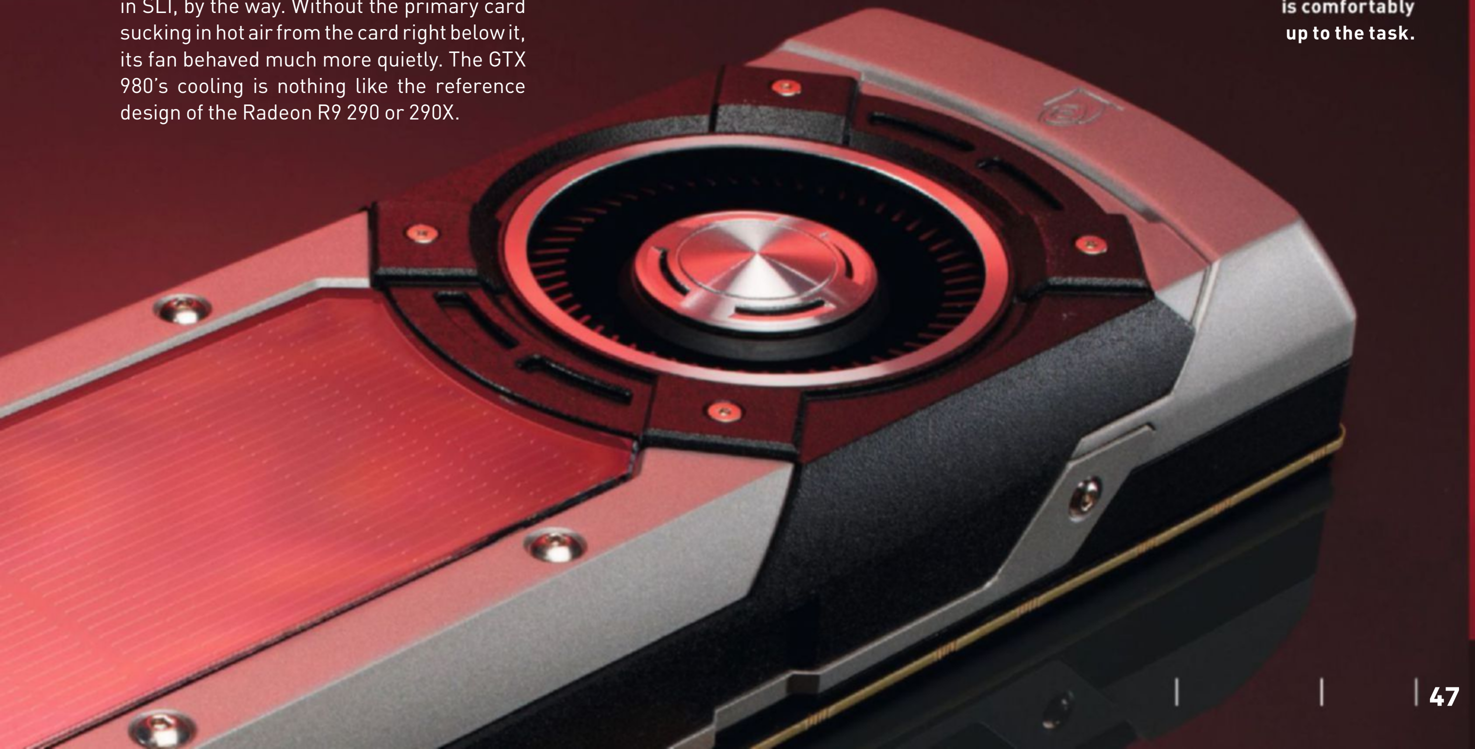
	GTX 980	GTX 780	GTX 780 Ti	R9 295X2
Tomb Raider	**66**	45	56	50
Metro: Last Light	**70**	52	53	48
Batman: Arkham Origins	131	122	**143**	90
Hitman: Absolution	77	74	**79**	79
Unigine Valley	80	72	**87**	41
Unigine Heaven	73	60	**77**	65
3DMark Firestrike	**17,490**	14,336	16,830	15,656

Best scores are bolded.

4K (3840x2160) BENCHMARKS

	GTX 980	GTX 780	GTX 780 Ti	R9 290X	R9 295X2
Tomb Raider	33	41	44	52	**53**
Metro: Last Light	**43**	21	27	29	26
Batman: Arkham Origins	**68**	60	65	67	66
Hitman: Absolution	42	40	44	**53**	**50**
Unigine Valley	39	**43**	40	24	19
Unigine Heaven	34	33	**44**	17	34

Best scores are bolded.



The 980's cooler is comfortably up to the task.

GIGABYTE GTX 970 G1 GAMING

Cool, quiet, and deliciously quick, Gigabyte's overclocked GTX 970 nails it

BY DAVE JAMES

If the new GeForce GTX 980 is a killer with a steep price, the much cheaper GTX 970 looks one hell of a card for just $329. Unlike with the 980, the first iterations of which are mostly stock-clocked reference boards, there won't be any 970 reference boards, so our first taste comes courtesy of Gigabyte. And it's really gone to town on the new 970 with the G1 Gaming, a factory overclocked card with custom cooling.

If you want to take it further than its factory-overclocked settings, you can even get mighty close to the performance of a reference-clocked GTX 980. And that means achieving superior gaming performance to a $1,000 GTX Titan Black. For not much more than £300. Yes, really. It's great.

Inside the GTX 970 you'll find the same Nvidia GM204 GPU that made the GTX 980 such an impressive graphics card, with just a few little nips and tucks to allow the lower price point. The big change is on the traditional streaming microprocessor units front. The SM count for the 970 is down from 16 to 13. That still gives you 1,644 CUDA cores for your money, but it's a pretty severe slicing from the 2,048 cores in the GTX 980.

However, the GTX 970 still has the same 2MB of L2 cache, the same 64 ROPs, the same 256-bit memory bus, the same speed and algorithmic advances in the actual memory itself, and crucially, the same 4GB frame buffer. It's the common memory capacity between the two latest Maxwell-powered cards that allows them to be such key players at the highest resolutions.

Cool runnings

Right from the outset then, it's clear that Gigabyte's G1 Gaming GTX 970 is aiming squarely at the bigger 980 beast. The base clock is 128MHz higher than the standard GTX 970, so this new card is running faster than the GTX 980 out of the box in terms of pure clock GPU terms. But that's just the base clock. The G1 Gaming's boost clock goes even further than the GTX 980's, hitting

GIGABYTE
GIGABYTE
GIGABYTE
GV-N970G1 GAMING-4GD

The overclocked 970 delivers $1,000 performance for not much more than $300. Yes, we like it.

1,329MHz as a standard turbo setting compared to the 1,216MHz of its bigger brother.

That's thanks to Gigabyte's powerful Windforce cooling array. The large triple-fan/triple-heatsink setup means it's a longer card than the standard GTX 980 design, despite having a shorter PCB, but also makes it a seriously effective cooling solution. With the factory-overclocked GPU working its silicon socks off, it was still only just about hitting a maximum temperature of 58 C. That's incredibly cool running for a proper high-end GPU, especially one that's capable of hitting 30fps at top 4K settings in *Battlefield 4*.

Even when we worked our own overclocking magic on the G1 Gaming, it was still only very occasionally hitting a maximum 64 C. With the GM 204 running at an incredible 1.5GHz, that's a staggering technical achievement. In fact, it's enough to have this G1 Gaming match a reference clocked and cooled GTX 980.

Game on

If that was the end of the story, you might still put your money on the reference GTX 980. After all, its GPU isn't being pushed as hard in order to achieve those speeds. But the Windforce cooling array really does make a tremendous difference; even operating at 1.5GHz, the G1 Gaming was running over 15 C cooler than the reference card.

Then there's the price. The stock GTX 970 starts at $329, and this factory-overclocked version is another $60 on top. But it's still way cheaper than a basic GTX 980. As for AMD's Radeon R9 290X, it's in trouble. Even the overclocked Tri-X version from Sapphire can't cool to the same extent, or provide performance to beat this cheaper card.

Even if AMD reacts by slashing prices, the Nvidia ecosystem arguably feels a little more vibrant right now, with some funky new technology (such as MFAA, VXGI, and DSR) making the Green Team seem more of a value proposition. In real terms, however, it's the additional straight-line gaming performance that gives this new Gigabyte card the overall win for us.

BENCHMARKS

	GTX 970 G1 GAMING	G1 GAMING OC	GTX 780 Ti XLR8	R9 290X TRI-X OC
DirectX 11 Synthetic 1600p Performance				
Heaven 4.0 (min/avg fps)	19/34	**29**/36	21/**41**	17/34
DirectX 11 1600p Gaming Performance				
Bioshock Infinite (min/avg fps)	**21**/70	18/73	19/**78**	16/58
Grid 2 (min/avg fps)	71/91	77/98	**80/101**	66/82
DirectX 11 4K Gaming Performance				
Battlefield 4 (min/avg fps)	20/29	**23**/31	22/**34**	12/32
Company of Heroes 2 (min/avg fps)	5/14	**10/16**	**10**/15	8/**16**
Thermal Performance, 100% GPU Load (°C)	**58**	64	80	71

Best scores are bolded.

IT'S A WRAP: OVER TO YOU, AMD

Performance junkies, rejoice! Haswell-E hits it out of the ballpark

Cheaper, faster, better. That's what new computer chips used to be about. More recently the rate of development in PC graphics has seemed to slow. With these new GPUs, Nvidia has taken us back to the golden age of graphics.

OK, the GeForce GTX 980 and 970 aren't massively faster than everything we've seen before. Indeed, the fact Nvidia's relatively ancient GK110 chip—in cards such as the GeForce GTX 780 Ti and Titan Black—is still pretty competitive just goes to show what an awesome bit of kit it really is.

But in the GTX 970, Nvidia has come up with something seriously special. For $329 you can have a card that will deliver pretty much the same gaming experience as the very fastest and most expensive 3D graphics from the outgoing generation. Yup, that's $329 for a $1,000 experience.

That Nvidia has pulled this off despite being stuck at 28nm through no fault of its own just makes these new Maxwell GPUs even more impressive. We can hardly imagine how insane Maxwell will be when it gets an inevitable shrink down to 20nm next year.

If there is a negative, it's the $550 pricing on the GTX 980 model. It's simply too big a premium to justify and that's a pity. As for AMD, it doesn't look pretty. All Nvidia's main rival can do is cut pricing to position its GPUs more competitively. And while that may be enough to deliver a great price-performance package—the Radeon R9 290 and 290X remain awesome GPUs—it will still leave AMD lagging on metrics like heat and overclockability. And it will also leave AMD selling big, expensive graphics chips for not a lot of money.

As far as we know, it won't be until 2015 and AMD's 20nm Pirate Islands chips that there's even a chance it will have something that can truly take on Nvidia's Maxwell. Until then, it looks like times will be tough for AMD. **–MPC**

GTX 980
GIGABYTE

THE FUTURE OF ESCAPISM

Technology and psychology are joining forces to increase gaming immersion like never before. But is it always a good thing? **By Dan Griliopoulos**

What is escapism? It's a step away from the pressures of the world that diverts you from the tedium and unpleasantness of everyday life. But it also has a negative side when taken to an extreme. In that sense, the escapist is removing themselves too much. Whether they're unable or unwilling to cope with the pressure, ignoring it only makes it worse.

Whether positive or negative, escapism can take many forms. A hot bath. A meditative retreat. A country walk. Watching the sunset over Machu Picchu. A holiday to a country where everything is cheap. Increasingly, though, it's technological. We've been to packed cities all over the world and on those occasions we're forced onto a bus or train, we see a fascinating social experiment.

The train at rush hour is a high-pressure environment. It's often too hot, crowded, smelly, and bumpy to be comfortable. In this high-stress situation, people across the globe react in different ways. In Japan, for example, many people fall asleep (or pretend to). They'll do this standing up, alone among strangers, for two or three stops. In Paris, rudeness ramps up to such a degree that the Metro company issued a book of tongue-in-cheek etiquette (http://onforb.es/1uJEq0W). In almost all major cities, people plug into their smartphones and play apps or music, or read on Kindles, and pretend the rest of the passengers, and the outside world, simply don't exist.

So how is technology aiding escapism? How do psychologists think escapism is going to change? Are the simulations we currently call games the perfect escapist tools, or do they add to the problem?

SONY

Call of Duty characters move too fast to feel natural in VR.

So we're talking escapism. And how technology and gaming can augment people's ability to get away from the troubles of the world in a healthy manner. Many mature technologies are already contributing to this immersion—high-resolution screens, surround-sound systems, well-designed user interfaces, touchscreens, motion sensors, haptic feedback, and so on. We can now touch, see, hear, and feel a photorealistic world.

The core technology that's most useful for escapism right now is virtual reality, with the modern forms working even better than the best 3D cinema. As psychologist Jamie Madigan told us: "Having a setup that allows you to forget about the technology between you and the game world is what spatial presence is all about, and from what I understand, VR setups do that very easily. In many ways, they trick our brain at the same level that reality does."

Often grabbing the headlines is the Oculus Rift VR headset, which Facebook bought for $2 billion in March 2014. The Rift hasn't yet reached a consumer-ready stage (though Mark Zuckerberg has said he wants to sell it as cheaply as possible), but the latest development kit (DK2) is already much higher resolution than the previous iteration.

RIFT VS. MORPHEUS

> “The goal is a wireless, light headset no larger than ski goggles.

We attended the Develop Conference in the UK to ask questions about virtual escapism and to get our hands (and eyes) on the Rift's first real competitor, Sony's Project Morpheus. It's a convincing challenger, and one of its strongest features is its ergonomic design. Though the Rift has improved substantially since the first time we used it, it's still an awkward piece of kit. It has straps and weights in strange places, making it a real workout for your neck. By contrast, Sony has used its experience in product design and outsourced all of the Morpheus's non-screen hardware to a small desktop box. This has resulted in a lighter headset with the same power and resolution as the Rift.

Sony has also focused on making the kit work natively with the PS4, its motion-sensitive Move controllers, and its camera. By targeting the PS4 instead of the PC, Sony has sacrificed raw power for standardized hardware and a living room experience. The only flaw is that Morpheus currently uses LCD screens instead of the Rift's superior OLED. Yet both are prototypes, and the ultimate goal for Oculus and Sony is a wireless, lightweight headset no larger than ski goggles. Whatever the hardware, giv-

Dr Richard Bartle says that social elements in games are essential.

Escapism is serious business for the creators of mobile game *Rival Knights*.

Sony's street luge VR demo uses realistic motion to create an immersive experience.

en its established audience and the competition in the console market, the Morpheus is looking more plausible as an early VR success than the Rift—the VHS to Oculus's Betamax, perhaps. But what do you experience on these devices? As gaming expands, it's becoming harder to speculate on where it's going. The simple answer would be "everywhere."

"The combination of evolving technology and ubiquitous experimentation might well lead to games being pervasive throughout the whole of society," explains Liquid Flower Games' music composer Joost Kraaijenbrink. "Physically speaking, we're already gaming everywhere. We all have handhelds, or at least games on our phones, so for most of us, wherever we go, we can play games."

THE ILLUSIONISTS

But it's not just hardware. It's about software in everything we experience, and all software having game-like elements. Technology isn't the only thing that leads to immersion; it's also how developers use it. Away from the Project Morpheus demos at Develop, Patrick O'Luanaigh of game developer nDreams offers tips to developers wanting to maintain immersion. He explains that players want to stay immersed, so the developer's aim is to maintain the illusion—by keeping movements smooth, avoiding the uncanny valley, and keeping speed realistic, for example.

Controls are equally important. Players can't see a controller, so developers might forgo the W, A, S, and D keys for the easier-to-find arrow keys. In *Call of Duty*, for example, your characters walk and sprint faster than the average human, and turn faster too, so it feels unnatural in VR.

Even in games whose settings are seemingly otherworldly or alien, the same rules apply. Game designer Kerry Turner has created *Heartwood*, a VR simulation of a strange woodland (http://heartwoodgame.com). Despite its whimsical premise, she focused on keeping it realistic. "I want, as much as possible, for the player to feel like themselves in a strange place," she explains. "I think

Psychology and Game Design

More ways for game designers to address psychological problems

Jamie Madigan has a PhD in psychology and writes a blog at www.psychologyofgames.com all about the psychology of gaming. He's impressed by the way designers use psychological studies. "You've got the guys at Riot using psychology to reduce toxic behavior in *League of Legends*, for example, by controlling how social situations are constructed within the game and providing players with different kinds of feedback about their behavior," he says.

"It's basic social psychology stuff, and it seems to be working. Other companies employ psychologists in their user interface design groups, and in playtesting. Anything that requires measurement of human behaviors and attitudes could benefit from the involvement of a psychologist."

However, he's also cautious about the degree to which the research itself is biased towards politically popular topics rather than practical learning. A lot of the psychological research now focuses on violence in games, games addiction, and using games in education. "Those are fine research topics," says Madigan, "but I would love to see more psychologists addressing more nuts-and-bolts features of game design. What is the best way to provide players with feedback about their progression through a game? What kinds of interactions do they want (and have) with other players? How can you best present comparisons with other players to motivate players to keep playing and improving? And, of course, how do you curb antisocial behavior?"

Oculus
Oculus
Development Kit 2

that tropes that suggest everyday reality—gravity feeling right, head movement when walking, that sort of thing—have an important part to play in the effect I'm trying to achieve. Having said that, I don't think they're important in all fantastical games. I think the real key to immersion is consistency—not necessarily consistency with reality, but an internal consistency that lets you experience that sense of presence."

Berni Good is the founder of Cyberpsychologist Limited, and consults on the intersection of psychology and gaming. She says that although developers have worked out some guidelines, there are psychological tricks and problems they have yet to discover. After all, current VR technology is comparable to the black and white era of movies.

The first trick she points to is maintaining the player's sense of competence, whatever they're doing. "[This] is a key psychological intrinsic need as researched within a psychological theory called Self Determination, first postulated by Deci and Ryan in 1985," she says. Given the clumsiness of players relative to their expectation of their own capability, ensuring competence is harder than it sounds. The Morpheus shark attack demo we played failed to maintain competence, as the player was given a flare gun that fired flares to no effect. Patrick O'Luanaigh's talk even suggested dispensing with the perception of your own body completely, because to make a believable body that matched every player's expectations—color, size, reactivity, texture, shape, detail—is nearly impossible.

World of Warcraft **buddies discuss whether they're socializers, explorers, killers, or achievers.**

> The presence in a virtual world will feel the same as in the real world.

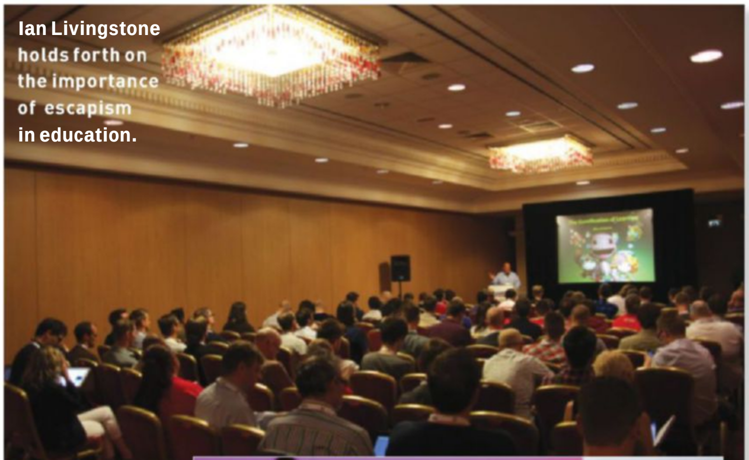
FEELING THE FLOW

This ties in with a sense of maintaining "flow," which Dr. Linda Kaye of Edge Hill University addressed at the conference. It's described as a state of energized focus, full involvement, and enjoyment. In games, flow is all about keeping a player absorbed, keeping them coming back. By balancing a game against a player's skill so they don't find it too hard or too easy, you can keep them in a flow state, even as part of a group of online players. As Berni Good puts it, "Developers can enhance flow by focusing more on the cognitive features in gameplay such as challenge, concentration, goals, and feedback."

Similarly, interactions with uncanny characters can bounce players straight out of their sense of immersion. The concept of the uncanny valley was first created by the robotics professor Masahiro Mori in 1970, and it's swiftly reached the same state in games as it has in robotics—if a character isn't utterly convincing, it's oddly off-putting and jarring. In terms of game design, it's often better to create something deliberately inhuman than something that only just fails to be human, as the eye is more critical of the latter and tars it with the brush of psychopathy. This can be a real problem if the developer intended that character to be sympathetic.

It's also worth keeping social elements alongside games' challenges. Dr. Richard Bartle (co-creator of the first MUD) split gamers into the four categories of explorer, socializer, killer, and achiever. These were fairly arbitrary, but have held up well as a sociology of gamers. Those socializers need some social elements to play with, even if they're only NPCs who make a little quip every time they sell the player a health potion.

Berni Good is an expert on the connection between psychology and gaming.



Ian Livingstone holds forth on the importance of escapism in education.

Develop's Indie Dev Day opened the floor to smaller game developers.

And, of course, the experts at the conference warned against using the cynical compulsion loops employed by free-to-play game developers everywhere—despite the way they can increase "flow"—because the player is bounced right out when the game asks for payment at a critical moment. "Some of the consumer psychology around this area sadly is being used by some developers to 'trick' the gamer into paying more," says Berni Good. "They know who they are, and frankly, it's not ethical."

She suggests that to achieve deeper immersion, VR must advance from a purely visual medium. "Enhancing presence will be key. I would suggest games will have built into them ways to dynamically feedback and change the direction of the game for each specific player by using tools such as advanced brain monitoring or other psycho-physiological and psychological tools," she explains. "I see a focus on presence to get to the point whereby the presence in 3D worlds will feel the same in a virtual world as in the real world."

Again, this may be a few years away, but who knows where we'll all be when the wearable technology revolution really takes off? It's not inconceivable that VR games will be able to interact with wearables, and any residual RFID tags in the area.

GAMING ADDICTION

Escapist games take all forms. Much escapism is helpful—giving you time to think about problems or allow wounds to heal—but it's not always positive. The Norwegian psychologist Frode Stenseng argues the flow state praised by Dr. Kaye and Good resembles the focused condition seen in addictions. He says flow can develop either harmoniously or obsessively, and all of the above techniques could be negative for someone in a poor mental state. The jury, after all, is still out on whether problematic gaming is actually gaming addiction.

Philippa Warr is a journalist, working for publications including *The Guardian* and *Wired*. She's candid about the fact she has had a problem with gaming—specifically with Valve's *Dota*, a multiplayer arena combat game. She uses the game to relax and step away from her problems. The issue isn't the gaming,

Livingstone believes gaming should be used in schools to help knowledge stick.

An Escapist's Education

Could VR games be used to improve learning in our kids' schools?

Education, you might think, is exactly the opposite of escapism. A traditional old-fashioned school, as depicted, for example, by Dickens in *Nicholas Nickleby*, was a fairly brutal institution—precisely the thing you'd expect a child to want to escape from. Yet, as Liquid Flower's composer Joost Kraaijenbrink points out, education has the potential to benefit greatly from gamifying and immersion.

"One learns best by doing, and the interactivity in games allows for a much more 'doing' approach than any other medium, without actually needing the resources (or risks) to do whatever you want to teach for real. Think simulators, not just for things like airplanes or cars, but also perhaps surgeons, architects, management, and so on."

Beyond the egalitarian benefits of letting anyone experience any job through simulators, which is still some way off, education could still benefit from the enthusiasm and reduction in stress that comes with "non-achiever" gameplay. After all, immersed, engaged, and relaxed children are receptive children.

At the Develop Conference, Ian Livingstone (former life president of Eidos, founder of Games Workshop, and co-creator of Fighting Fantasy) explained how he thought education should change. "In schools today, we focus too much on the computational nature rather than the how, when, and the why," he said.

syber
power to play

intel inside CORE™ i7

PLAY IT ALL. ANY GAME, ANY TIME, ANYWHERE

STORE
LIBRARY
COMMUNITY
GAMES
DUNLOP
LT WEB
A SELECT
FRIENDS RT

Starting $599
Learn more at www.sybergaming.com

Intel® Core™ i7 Processor

intel

Intel® is not responsible for and has not verified any statements or computer system product-specific claims contained herein. Intel and the Intel logo are trademarks of Intel Corporation in the U.S. and/or other countries.

syber
power to play
A DIVISION OF CYBERPOWER PC

www.sybergaming.com
888-937-5580
730 Baldwin Park Blvd
City of Industry, CA 91746

League Of Legends uses psychology to control situations and reduce toxic behavior.

which is reassuring; it's that it's not helping with her problems.

Warr's Steam profile reveals she's spent nearly 1,500 hours playing the game. "Sometimes you need to occupy your mind with something other than what's bothering you," she says. "Games can do that, especially ones like *Dota* where there is so much to learn but you do so through a rhythmic match setup. It's comforting because of the repetition of the map and the basic phases, but stimulating because of the variety within that."

BACK TO REALITY

At some point, however, Warr's *Dota* gaming turned from a positive comfort into a place to avoid her problems. "I realized I was only feeling better while playing. As soon as I logged out, that feeling would evaporate. It wasn't having a knock-on positive effect, even in terms of offering a bit of respite and letting you come back a bit refreshed. That was the point I felt like I was hiding and that it was a negative thing. I wasn't even enjoying the game. I was just enjoying not having to deal with depression for an hour at a time, or feeling like I was socializing without having to actually talk about anything."

Professor Jeffrey Snodgrass of Colorado State University explored this contradiction in a 2014 paper called *Motivated MMO Play and the Pleasures and Perils of Online Experience*. He found some interesting distinctions in how players reacted depending on how they played a sample game, the ubiquitous MMO *World of Warcraft*: "The authors find that playing to achieve is strongly associated with distressful play; results that support findings from other studies," says Prof. Snodgrass. "By contrast, social and immersion play lead more typically to positive experiences, conclusions diverging from those frequently reported."

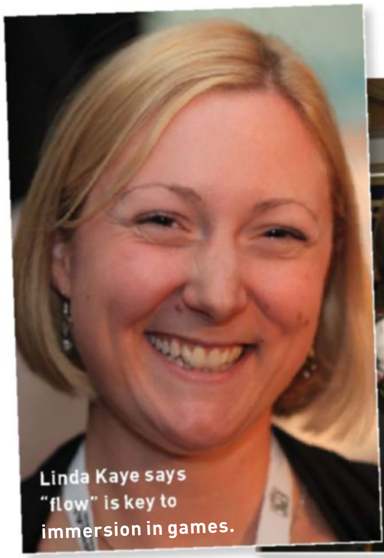
> "That was the point when I felt like I was hiding, it was a negative thing.

Berni Good explains the study also seems to show that less stressed individuals benefit more easily from the relaxation offered by games, while individuals bringing stress into the game don't get the relief they seek.

That tallies with Warr's *Dota* experience, where she felt the social side of the game had become token, secondary to a very competitive culture, which failed to dissipate the stress and depression she was feeling during her actual day-to-day life.

Technology is mediating our contact with the outside world, and allowing us to contact each other's private worlds more and more easily. Imagine everyone you might see in rush hour today, locked away in their heads, sleeping while standing or playing games on their phones.

Now imagine stepping into the same scene, but everyone is wearing VR sunglasses and playing games entirely by themselves, heads bobbing and mouths moving in a hundred fantastical dialogues. It's an alien world, but it may be coming. And it won't be good for everyone. ⏻



Linda Kaye says "flow" is key to immersion in games.

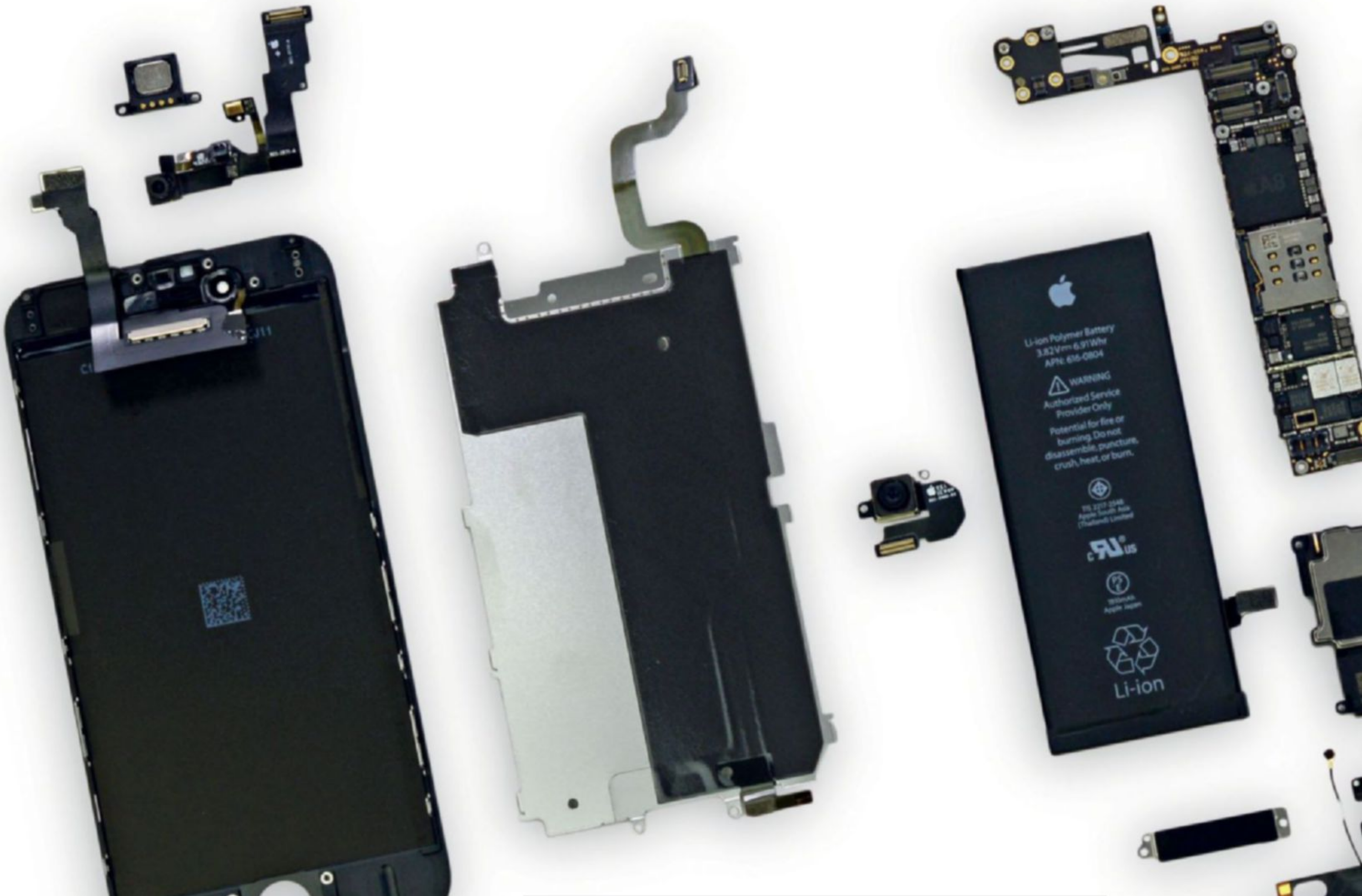
Develop allows gamers, developers and industry leaders to share their insights.

IFIXIT presents:

AUTOPSY

THIS MONTH WE DISSECT...

Apple iPhone 6



The battery pull tab, meaning a pry tool isn't needed, is a nice touch.

BACKGROUND:

Call us just another member of the Borg tech collective, but resistance truly is futile. Apple has a new iPhone out and we've just gotta look inside. Besides, the iPhone 6's CPU packs no fewer than two billion transistors. That's more than Intel's finest quad-core Core i7-4970K chip for the LGA1150 socket. Hell, it's not all that far off its new eight-core beast, the 5960X. Makes you wonder what Intel's been up to recently.

MAJOR TECH SPECS:

- Apple A8 dual-core SoC with 64-bit architecture
- M8 second-generation motion coprocessor
- 16GB, 64GB, or 128GB flash memory storage
- 4.7-inch 1334x750 pixel Retina HD display
- 8MP iSight camera (with 1.5μ pixels and phase-detection autofocus) and a 1.2 MP FaceTime camera
- Touch ID home button fingerprint sensor, barometer, 3-axis gyro, accelerometer, ambient light sensor
- 802.11a/b/g/n/ac Wi-Fi, Bluetooth 4.0, NFC, 20-band LTE

KEY FINDINGS:

- The first thing we notice is the "bump," the slightly sticky-outy camera that's a consequence of the iPhone 6's improved optics. Just how big is it? Our calipers say 0.6mm.
- The Pentalobe screws remain, which is good—it means no heating action is require to crack open the case. Inside are Phillips screws and a battery-pull tab, which is preferable to levering out the 1810mAh, 3.82V Lithium-ion Polymer battery (with an energy rating of 6.91Wh!).
- The battery is smaller than the iPhone 6 Plus's 2,915mAh battery, but up from the 1,560mAh unit in the iPhone 5s.
- Good news. The rear-facing camera is easily removed with tweezers. But it lacks the fancy optical image stabilization of the camera in the iPhone 6 Plus.
- Now the logic board. On the front is the Apple A8 APL1011 SoC with 1GB of SK Hynix RAM. Then there's the Qualcomm MDM9625M LTE modem and a plethora of other devices. On the back, 128GB of Samsung flash memory, a Wi-Fi module, touchscreen controller, M8 motion controller, and more.
- Bad news. The headphone jack and Lightning connector now reside on one cable, so you can't replace just one of them.
- Repairability Score: 7 out of 10 (10 is easiest to repair). Continuing the iPhone 5 trend, the display assembly comes out first, simplifying screen repairs. The battery is straightforward to access. Removing it requires a proprietary Pentalobe screwdriver and knowledge of the adhesive removal technique, but isn't difficult. The fingerprint sensor cable has been re-routed, fixing a significant issue with the iPhone 5s and making the phone much safer to open. Apple doesn't share repair information.

About iFixit

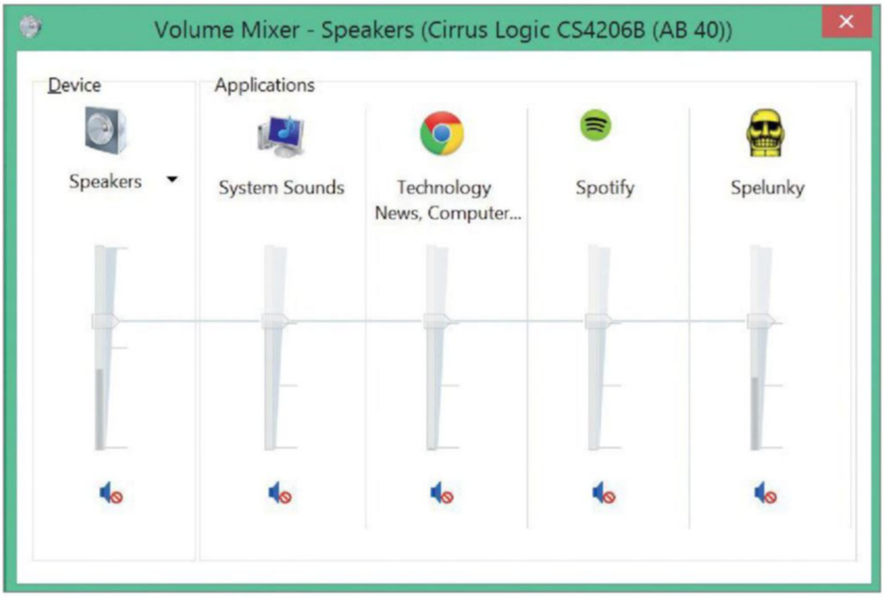
iFixit is a global community of tinkerers dedicated to helping people fix things through free online repair manuals and teardowns. iFixit believes that everyone has the right to maintain and repair their own products. To learn more, visit www.ifixit.com.

GIGABYTE™
NVIDIA GEFORCE GTX
BORN TO GAME
GeForce GTX 900 Series
G1™ GAMING
Graphics Cards
SUPER OVER CLOCK
FLEX DISPLAY
WINDFORCE

HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP OF THE MONTH

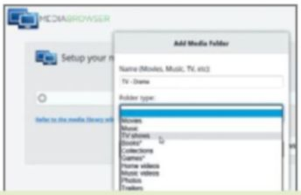

Volume Mixer - Speakers (Cirrus Logic CS4206B (AB 40))
Device
Applications
Speakers
System Sounds
Technology News, Computer...
Spotify
Spelunky

SET DIFFERENT VOLUME LEVELS FOR DIFFERENT APPLICATIONS

Windows has a built-in audio mixer, which allows you to set a different volume level for each application running on your system. If you've gotten in the habit of adjusting the master volume every time you switch programs, cut it out! To access the mixer, click on the volume control icon in the toolbar, then click on the button marked "Mixer."

MAKE – USE – CREATE

62 Keep Windows XP forever



65 Set up a digital media library

ALEX CASTLE
CONTRIBUTING EDITOR

CLEANING UP YOUR DOCUMENTS FOLDERS

A constant frustration for me is that my Documents folder—one of the most important places on my PC—has a tendency to turn into a total cesspit. I don't notice while it's building up, and then one day I go to look for a file and find myself spending 15 minutes searching through poorly-categorized files. To combat this, I follow three simple rules.

First, have a place for everything. Make sure you're actually using the Documents folder (which is very important for search) and that you've got different kinds of documents in different folders. Keeping your photos in the photos folder and so on will make finding things much easier.

Second, archive frequently. Chances are there are lots of files in Documents that you'll never, ever need to open again. Dump them in an archive folder on the cloud or elsewhere on your hard drive. And finally, delete the dupes. Not every file deserves to go to the archive—use an application such as Duplicate Commander (free, http://rayburnsoft.net/dc.html) to find and delete duplicate files.

↘ submit your How To project idea to: comments@maximumpc.com

Keep XP Forever

YOU'LL NEED THIS

ANTIVIRUS/MALWARE PROTECTION

Third-party security software is vital if you plan to stay online.

A BROWSER THAT ISN'T INTERNET EXPLORER

Firefox, Chrome, or Opera.

EVERYBODY PANIC. Microsoft stopped supporting Windows XP and we've had no updates for months. Planes could fall from the sky and power stations could run backwards. Or not. Since Microsoft clocked-off in April, not a lot has happened. Is there any real cause for concern? Well, probably. Especially regarding security, thanks to no more antivirus and malware updates, and no patches to cover those little holes in the code. But that doesn't mean it's all over. For a start, there are still more XP machines out there than you might think. *The Economist* estimates 39 percent of business machines still run XP, while Microsoft thinks 21 percent of all desktop PCs have stuck with it. That huge user base is good news. Microsoft may have pulled the support plug, but everybody else is free to continue, and they will do, for as long as the demand is there. Just follow these steps and your XP box should be good for a long time to come. –**CHRIS LLOYD**

1

GO INTO HIDING

If you want to be totally sure you won't be compromised, go offline. It's a little drastic, but it's safe. If you only use a second XP box to run a favorite old game or app, you can network it to your main system and keep it away from software upgrades. It should then chug along nicely for years. But if Internet isolation feels too extreme, there's still no reason to get too worried. You'll just need to start putting security precautions to use. We all know what good practice is, we just don't always follow it.

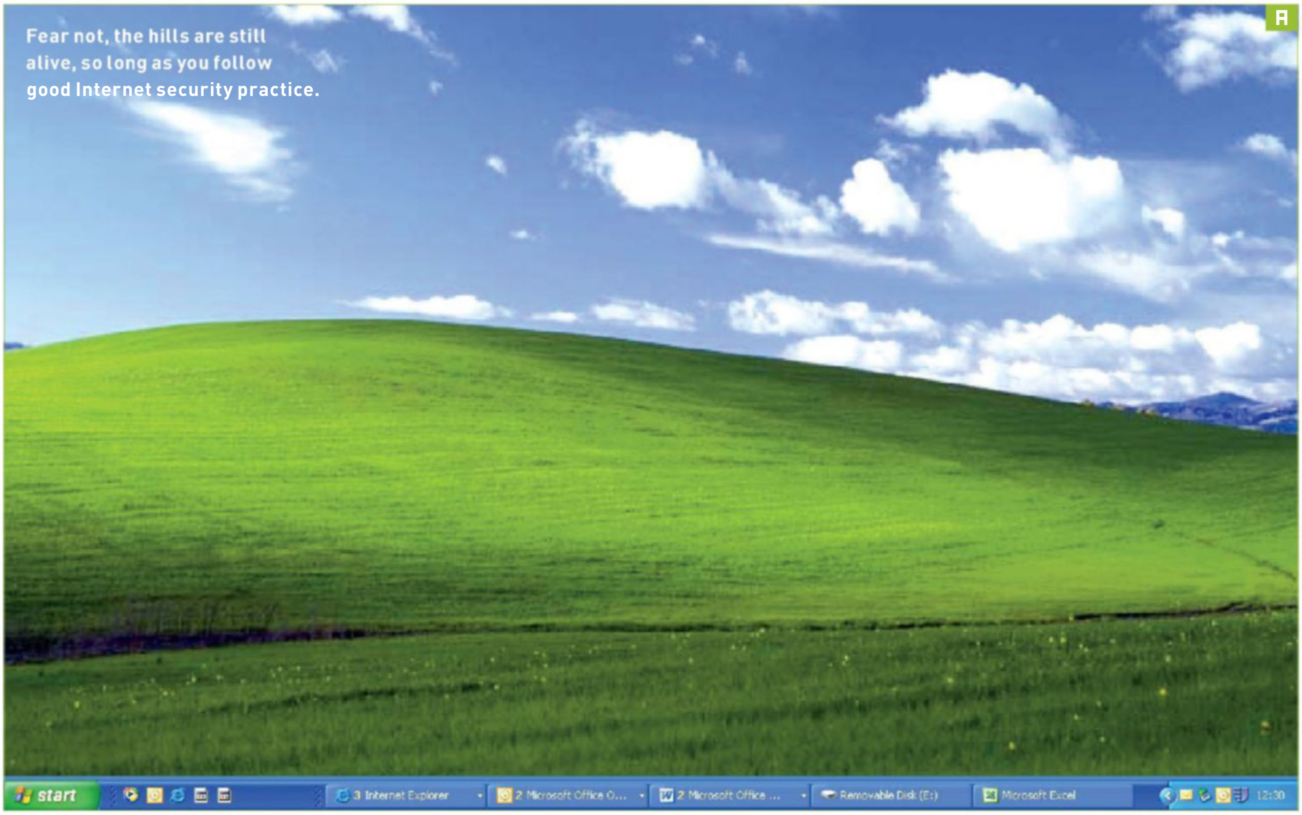
» Microsoft has a vested interest in getting us to upgrade, of course, but it's not *all* about the money. Progress means dropping old systems, and Internet security means keeping up to date. Staying with XP could go horribly wrong, but it's unlikely. Many XP systems run undemanding apps in quiet corners of the world where there's no real reason to upgrade at all. We all will at some point, but there's no need to rush. Panic over (**Image A**).

2

CAN'T UPGRADE?

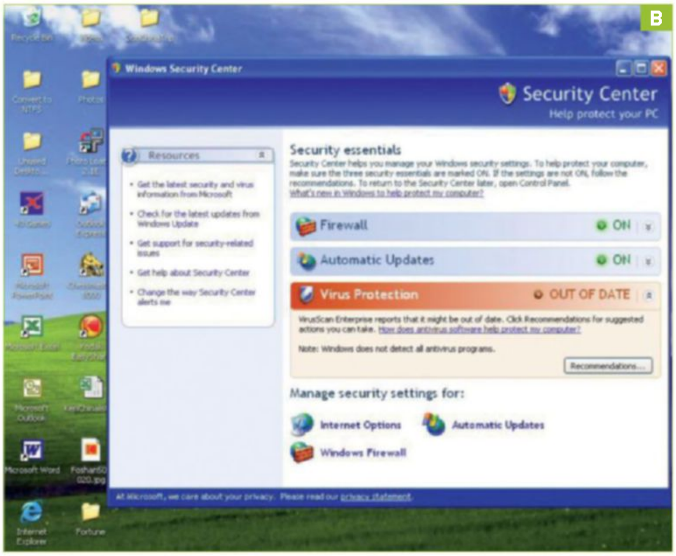
Apart from the real possibility you've turned into a miser, there are lots of reasons for sticking with XP. Maybe you've a big old printer whose drivers require it. Or your box may not be up to an upgrade. Windows 8 won't get out of bed for anything less than a 1GHz chip backed by 2GB RAM and a DX9 graphics card. If your machine is old, it's probably not a good idea to burden it with such an impossible task. It'll turn into a laboriously slow thing. XP was happy with 300MHz and 64MB of RAM (and it has been for 12 years).

» Have you considered Linux? It comes in many flavors, but Ubuntu was designed for Linux newbies with an eye on smooth transfers from Windows. Its desktop can be made to resemble Win7, and it'll run happily, and speedily, on more challenged hardware (it can run on as little as 64MB of RAM). There's a ton of high-quality apps and utilities. Oh yes, and it's free.



A

Fear not, the hills are still alive, so long as you follow good Internet security practice.


B
Windows Security Center
Security Center
Help protect your PC
Resources
Firewall
ON
Automatic Updates
ON
Virus Protection
OUT OF DATE
Recommendations...
Internet Options
Automatic Updates
Windows Firewall

Security essentials

Security Center helps you manage your Windows security settings. To help protect your computer, make sure the three security essentials are marked ON. If the settings are not ON, follow the recommendations. To return to the Security Center later, open Control Panel.

What's new in Windows to help protect my computer?

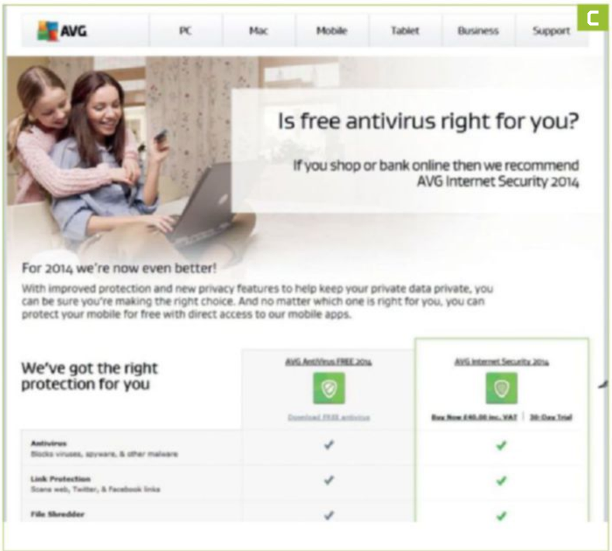
- Get the latest security and virus information from Microsoft
- Check for the latest updates from Windows Update
- Get support for security-related issues
- Get help about Security Center
- Change the way Security Center alerts me

VirusScan Enterprise reports that it might be out of date. Click Recommendations for suggested actions you can take. How does antivirus software help protect my computer?

Note: Windows does not detect all antivirus programs.

Manage security settings for:

At Microsoft, we care about your privacy. Please read our privacy statement.


C
AVG
PC
Mac
Mobile
Tablet
Business
Support

Is free antivirus right for you?

If you shop or bank online then we recommend AVG Internet Security 2014

For 2014 we're now even better!

With improved protection and new privacy features to help keep your private data private, you can be sure you're making the right choice. And no matter which one is right for you, you can protect your mobile for free with direct access to our mobile apps.

We've got the right protection for you

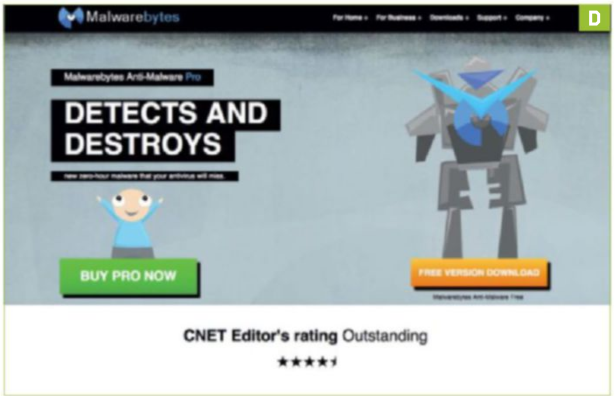
	AVG AntiVirus FREE 2014	AVG Internet Security 2014
Antivirus Blocks viruses, spyware, & other malware	✓	✓
Link Protection Scans web, Twitter, & Facebook links	✓	✓
File Shredder	✓	✓

TACKLING INFECTIONS

3 Despite the initial scare stories, XP will actually have decent protection for some time to come. Support for Microsoft Security Essentials, for example, was originally going to be pulled on D-Day, but won a reprieve. It'll now get updated signatures until April 2015, which is nice, though MSE was never the best security software anyway (**Image B**).

» In a recent poll by AV-Test, 30 leading antivirus vendors all indicated they would continue XP support for at least a year, and most beyond that. Bitdefender says it will keep going until 2017, and Kaspersky until 2018. Symantec is less forthcoming, but it won't leave you hanging. The usual suspects are still good for up-to-date protection (**Image C**).

» If your PC is infected, one of the best tools for cleaning things up is Malwarebytes Anti-Malware (**Image D**). This does a really good job of catching things that have sneaked through other defences. It's worth scanning your drive with this every now and again, or if you have any suspicious behavior. The company says it will continue with XP support "for some time."


D
Malwarebytes
For Home
For Business
Downloads
Support
Company
Malwarebytes Anti-Malware Pro
DETECTS AND DESTROYS
BUY PRO NOW
FREE VERSION DOWNLOAD

CNET Editor's rating Outstanding

XP'S VIRTUAL REALITY

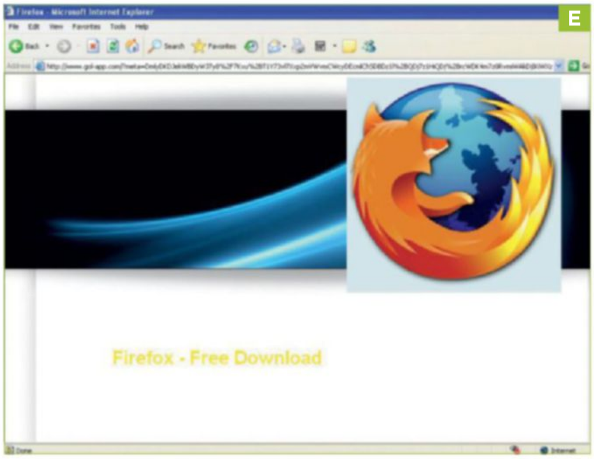
If you want to upgrade but can't stand losing XP, don't worry, you can do both. It's possible to continue running XP on a Windows 7 PC by creating a virtual machine. We prefer to use VMware to get this going, as it's a little faster and more flexible than Microsoft's Virtual PC. Go to www.vmware.com/products/player and scroll down until you see "Free for personal use."

Install the program and fire it up. Then select "Create a new virtual machine" and pop your XP disc in the drive, or direct it towards an ISO file and off you go. You can create as many virtual machines as you like. It's a great playground for testing, and if it gets mangled or infected, you can just delete it and use another.

There are limits, however. There's no direct link between the software drivers of the virtual machine and your hardware. In other words, you won't get decent graphics because it can't get at your 3D card, so other than *Solitaire*, games are out. There's still a degree of integration with the outside world though—you can launch your XP apps from outside the virtual machine, for example, and create shared directories for data. Welcome to the best of both worlds.

vmware
VMware Player Plus
The Easiest Way to Run a Virtual Machine
VMWARE PLAYER 6 PLUS
Virtual Machines on Your PC
Best Way to Deliver a Managed Desktop

VMware allows you to upgrade your PC and run XP through a virtual machine.


E
Firefox - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Firefox - Free Download

4 PRACTISE GOOD PRACTICE

It's time to kick sloppy habits and start taking defence more seriously. For starters, say goodbye to Internet Explorer and get a new browser. With no more support, it's time to move to Firefox, Chrome, or Opera (Image E). Install one and kill IE. Details are sketchy, but the big three all claim they have no immediate plans to ditch active XP support before 2015 at the earliest. Actually, it's good news for them, as they have millions of new potential users. If you do nothing else, do this.

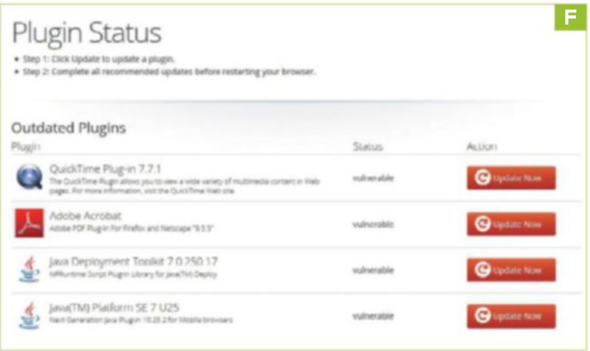
» Say farewell to Java. The Java browser plugin is especially prone to leaks, and is a nice way for code to get itself run without permission. If you can live without it, disable it. Other plugins can be troublesome too—Adobe Flash and Reader in particular. Get yourself over to the lovely Mozilla Plugin Checker (www.mozilla.org/en-US/plugincheck). This'll show you what's installed and what needs updating (Image F).

» Prepare for XP reinstallation by backing it up, because you know you'll have to do it at an inopportune moment. If your XP disc is an older one then having the patches stored locally, ideally on another drive, will save you a lot of grief. It's a lot faster, and you don't have to go online with XP unpatched. Keep copies of drivers you know XP likes best, too, especially for your network and graphics cards.

» An easy way to protect your XP installation is to stop running in Admin mode by default. If you don't have users with limited permissions, now may be the time to start using them. This will stop unwanted executables from putting themselves about. Go into "User Accounts" in Control Panel and create an Admin account (Image G). Log in using this, go to your user account, and change it to a Limited account.

» If you've any doubt about something you're about to install, scan the file before you run it (Image H). Right-click on the executable and select "Scan with [your security software]." This will be Microsoft Security Essentials, unless you've third-party security software running.

» You should start using a third-party firewall if you aren't already. Microsoft's XP firewall was always pretty lightweight anyway. Top contenders are Zone Alarm and Comodo (Image I). Both are available as free versions, and both promise to continue with Windows XP support for the time being, too.

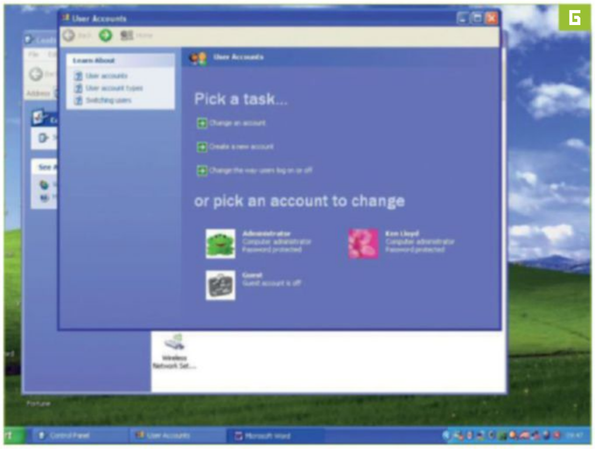


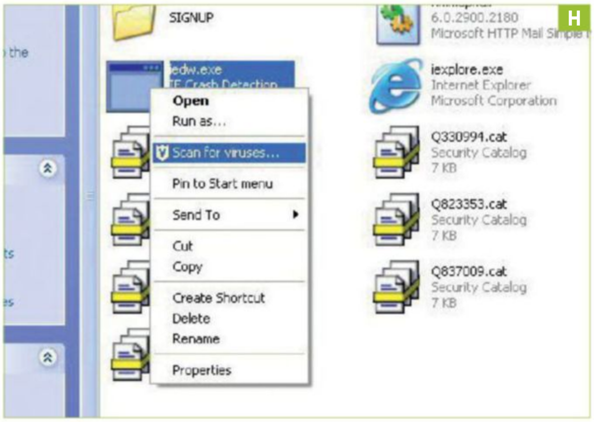
Plugin Status

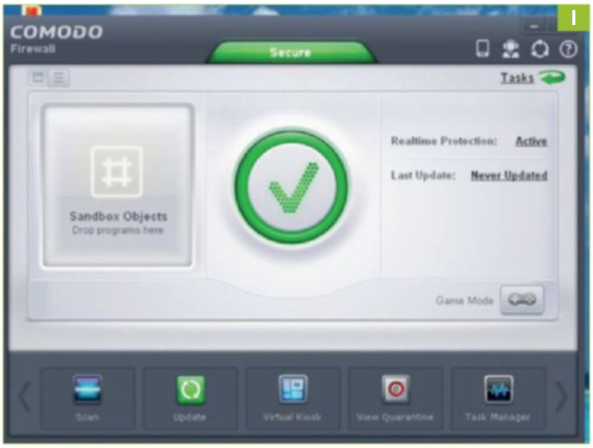
- Step 1: Click Update to update a plugin.
- Step 2: Complete all recommended updates before restarting your browser.

Outdated Plugins

Plugin	Status	Action
QuickTime Plug-in 7.7.1 The QuickTime Plugin allows you to view a wide variety of multimedia content in Web pages. For more information, visit the QuickTime Web site.	vulnerable	Update Now
Adobe Acrobat Adobe PDF Plugin For Firefox and Netscape "9.5.5"	vulnerable	Update Now
Java Deployment Toolkit 7.0.250.17 NPRuntime Script Plug-in Library for Java(TM) Deploy	vulnerable	Update Now
Java(TM) Platform SE 7 U25 Next Generation Java Plug-in 10.25.2 for Mozilla browsers	vulnerable	Update Now


G
User Accounts
Learn About
User Accounts
Pick a task...
Change an account
Create a new account
Change the way users log on or off
or pick an account to change
Administrator
Guest


H
SIGNUP
6.0.2900.2180
Microsoft HTTP Mail Simple
iedw.exe
IE Crash Detection
Open
Run as...
Scan for viruses...
Pin to Start menu
Send To
Cut
Copy
Create Shortcut
Delete
Rename
Properties
iexplore.exe
Internet Explorer
Microsoft Corporation
Q330994.cat
Security Catalog
7 KB
Q823353.cat
Security Catalog
7 KB
Q837009.cat
Security Catalog
7 KB


I
COMODO
Firewall
Secure
Tasks
Sandbox Objects
Drop programs here
Game Mode
Scan
Update
Virtual Kiosk
View Quarantine
Task Manager

Realtime Protection: Active

Last Update: Never Updated

Set Up a Digital Media Library

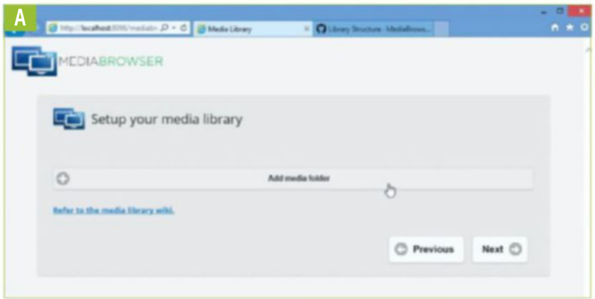
YOU'LL NEED THIS

MEDIA BROWSER
A free media tool.

MOST OF US HAVE MUSIC, MOVIES, AND PHOTOS STORED ON OUR PCS, but how can we access them from other computers, mobiles, and smart devices without creating extra copies? The solution is to set up a media server, and Media Browser is the perfect tool, particularly if you want to share access with other people in your house. It organizes your files into user-defined libraries, automatically downloading artwork and information like episode synopses. You can set up separate user accounts and regulate access using parental controls. Read on to find out how to set it up. **–NICK PEERS**

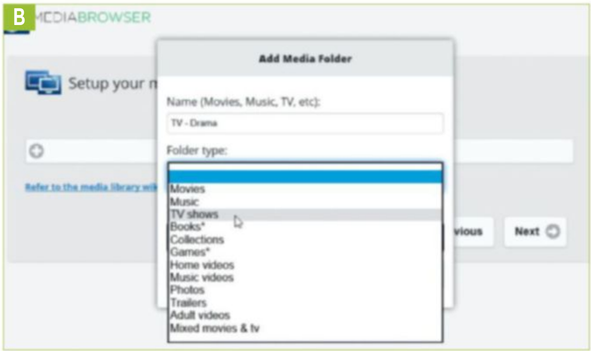
1 SETTING UP YOUR SERVER AND MEDIA LIBRARY

Download Media Browser from http://mediabrowser.tv and install it on your host PC. The configuration wizard will launch. Select your language, verify your username, and click "Next." Now select your first media folder (**Image A**). For Media Browser to work, your media files must be named correctly—click the "Refer to the media library wiki" link for brief details. Once your files are all named correctly, click "Add media folder."


A
MEDIABROWSER
Setup your media library
Add media folder
Refer to the media library wiki.
Previous
Next

2 CREATING LIBRARIES

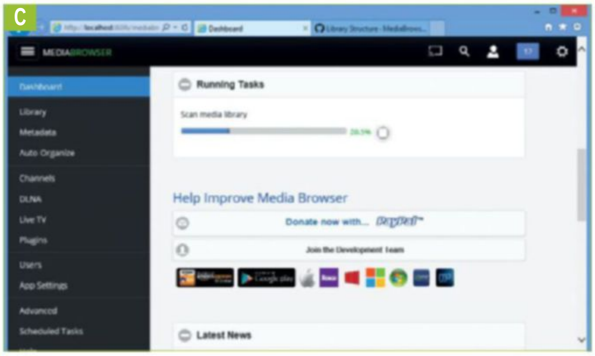
Give your folder a name, such as "TV–Comedy." Select the folder type from the drop-down menu and click "OK" (**Image B**). Click "Media Locations" to select the folder on your hard drive, find the target folder, then click "OK." You can add multiple folders to the same library—click "Add media locations" to select them. Then click "Add media folder" to create another one the same way. Once you're done, click "Next."


B

Name (Movies, Music, TV, etc): TV - Drama
MEDIABROWSER
Setup your m
Add Media Folder
Folder type:
Movies
Music
TV shows
Books*
Collections
Games*
Home videos
Music videos
Photos
Trailers
Adult videos
Mixed movies & tv
Refer to the media library wiki
vious
Next

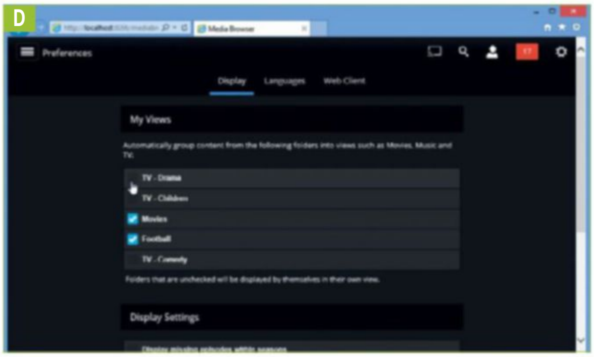
3 CONFIGURE SETTINGS

You'll be prompted about downloading artwork and metadata—leave it ticked so Media Browser can display posters and episode information. Leave the "Save artwork" box unticked, unless you plan to edit it. Set country to USA, then click "Next." Leave the next three boxes ticked and click "Next." Ignore the bit about Windows Service (we're sticking to the desktop app here). Click "Next," then "Finish." You'll be taken to the dashboard (**Image C**). Explore the library to see your media.


C
MEDIABROWSER
Dashboard
Library
Metadata
Auto Organize
Channels
DLNA
Live TV
Plugins
Users
App Settings
Advanced
Scheduled Tasks
Running Tasks
Scan media library
Help Improve Media Browser
Donate now with... PayPal
Join the Development Team
Latest News

4 PERSONAL PREFERENCES

Select "Users" and click "Add User" to set up your buddies. Untick "Allow this user to manage the server" and click "Save." If it's a child, click their username and switch to "Library Access." Click the person icon at the top and choose "My Preferences." If you have multiple libraries, untick them under "My Views" so they appear as separate categories (**Image D**). ⏻


D

My Views

Automatically group content from the following folders into views such as Movies, Music and TV.

☐ TV - Drama
☐ TV - Children
☑ Movies
☑ Football
☐ TV - Comedy

Folders that are unchecked will be displayed by themselves in their own view.
Preferences
Display
Languages
Web Client
Display Settings

BUILD IT

GORDON MAH UNG **EDITOR-IN-CHIEF**

Building a Haswell-E Box

It may not seem it at first, but Intel's new Haswell-E "Lite" is a sweet deal and a solid foundation for a build

LENGTH OF TIME: **2–4 HOURS**

LEVEL OF DIFFICULTY: **MEDIUM**

GEFORCE GTX
LG
CORSAIR

THE MISSION

WE'VE FOUND THERE ARE REALLY two kinds of PC builders today. Those who are content with Intel's "consumer" LGA1150 socket, and those who always go for the big-boy socket. Yes, these are the folks who opted for an LGA1366 instead of LGA1155, and when faced with LGA2011 or LGA1150, they went for the larger pin- and core-count again. For you, the new LGA2011-V3 and Haswell-E means it's time get building with Intel's "bargain" Core i7-5820K part. This $390 chip gets you six cores without paying the $560 premium pricing Intel applied to its previous six-core processor.

With DDR4, a new chipset, and a new socket, it's time to run you through the steps and know-how you need to build a new Haswell-E rig. And what do you know, we just built and overclocked one for this month's cover story, so we decided to show you how we did it.

NOT A BUDGET BOX

THIS IS A SIX-CORE, fire-breathing enthusiast machine meant to keep your computing needs satiated for the next 36 to 48 months. And just as you don't buy a Mercedes with manual-crank windows and AM radio, we didn't skimp here. We outfitted this rig with very nice components befitting its six-core royalty. Yes, there are ways to cut costs. If we really wanted to budget-out this baby, we could have used a cheaper case, cut the SSD size, and gone with RAM without a heat spreader. We could also notch down the GPU and ditch the optical drive, too. At that point, you might as well have built a Pentium K box.

So, we've established our intention to build a nicely configured machine, but here's the thinking behind a few of our choices. Of all the parts here, spending $60 on an optical drive may seem extravagant, but as it may be the last optical drive you own, it might as well do everything, including burning BDXL discs. The other part sure to get attention is the 500GB Samsung 840 EVO drive. With a 3TB HDD in the box, do we really need to spend that much on the SSD? Yes. With the prices today, we believe the 500GB mark is the new "normal" for primary storage.

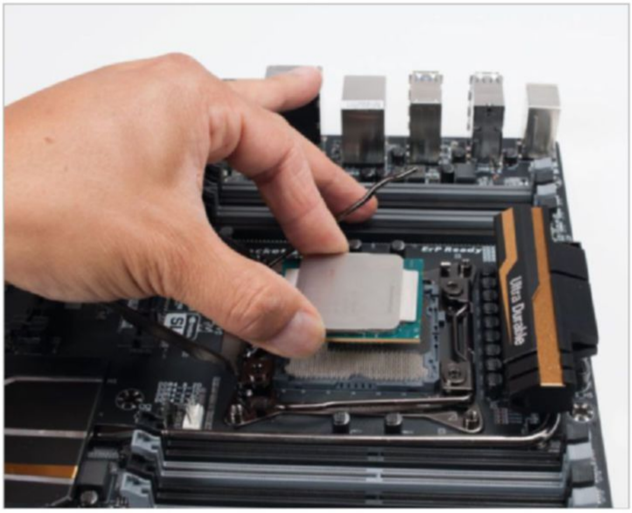
INGREDIENTS

PART		PRICE
Case	Corsair Obsidian 750D	$150
CPU	Intel Core i7-5820K	$390
CPU Cooler	NZXT Kraken X61	$124
Motherboard	Gigabyte GA-X99-UD4	$250
RAM	16GB Corsair Vengeance LPX DDR4/2666	$320
GPU	Zotac GeForce GTX 980	$550
SSD	500GB Samsung 840 EVO	$269
HDD	3TB WD Caviar Green	$107
ODD	LG WH16NS40	$60
PSU	Enermax Revolution XT 730	$125
Lights	BitFenix Alchemy Connect LED Strips	$50
OS	Windows 8.1	$99
Total		$2,494

1

LGA2011-V3 WHAT?

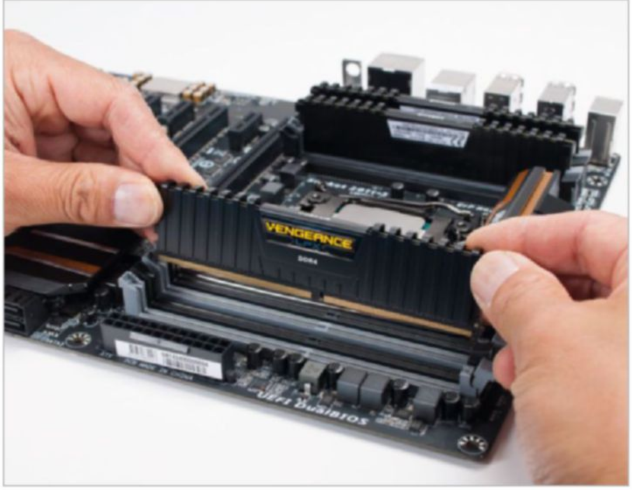
HERE'S THE PSA for folks who don't follow current events: LGA2011-V3 is not, repeat, NOT, compatible nor the same as the previous LGA2011 socket. You may snicker, but there will be people buying mobos and CPUs that are incompatible and not realize it until they've trashed the motherboard. Installing the LGA2011-V3 part isn't all that different from its predecessor. Unlatch both arms on the socket, remove the plastic cap, and line up the chip by referencing the small triangle in the corner of the CPU with the triangle on the socket or motherboard. The notches in the CPU should also line up. Now, lower the CPU into the socket without sliding it around or touching the pins in the socket, and latch it in place. Don't throw away the plastic cap. You'll need it if you have to return the board for service.



2

BECAUSE IT'S ONE BETTER

YOU DON'T HAVE TO put RAM in with the motherboard outside of the case, it's just a lot easier. DDR4 is the new hotness and offers eventual higher capacity and higher speeds, too. As Haswell-E features a quad-channel memory controller, you should consult your motherboard manual on which slots to put your four DIMMs in. On boards that feature latchless connectors on one side, you need to ensure the RAM is fully seated; we've botched installs by not fully seating the RAM. There is a slight curve in DDR4 modules to aid seating it, but you should still make sure RAM is fully seated—it's the typical rookie builders mistake. You should also now install the back plate that comes with the cooler, too.



3

PUT IN YOUR FOUNDATION

YOU'RE NOW READY to install the board. First, install the I/O shield in the case firmly. Now, count how many mounts are in the case and make sure they are properly torqued down and cannot unscrew. The mounts should match the number of holes in your motherboard. Screw down the motherboard and begin connecting fans to available fan headers and the like. With this motherboard in particular, plug the wire from the I/O shield into the nearby header for it. This powers the nifty blue and red LEDs integrated into the I/O shield. If it bugs you, you can control this LED from within the Gigabyte utilities in the OS, which let you turn it off, turn it on, or even have it blink. You should also plug in the rest of the umbilicals you need, such as USB 3.0 and front-panel controls. You should install your PSU now, too.

4

SATA CONFUSION

ONE OF THE MOST COMMON mistakes is to use the wrong SATA ports. Unlike that gimpy X79 chipset that only had two native SATA 6Gb/s ports, X99 has all SATA 6Gb/s ports. Still, rooks will plug into a third-party SATA port that isn't as fast or isn't even on. We prefer to run off of the native chipset ports first because they generally perform the best and there's no need for drivers for most OSes. On this board, there's also a SATA Express port that shares the SATA ports. Don't worry about it. We haven't seen a SATA Express device yet, and storage vendors seem pretty blasé, so for now, don't sweat it. As with RAM, we recommend basic RTFM protocol before plugging in any drive. We also recommend installing the GPU after plugging in and running the SATA cables, as the card will block access to the ports.

5

YOLANDA, WHAT'S FONZIE LIKE?

TO COOL THIS RIG, we recommend mounting the radiator first so as not to put undue pressure on the hoses and motherboard. To do that, though, you'll need to put the cooler in the top of the case and hold it in place with one hand while screwing down one of the corners. Keep the rest of the screws handy, too. Once you have one corner of the rad in place, put a screw in the opposite corner from the first point you mounted it. Only after you have done this can you remove your hand from the radiator. Now, just mount the pump and cold plate to the CPU and plug it into power. As this cooler is "smart," you'll need to plug it into an available USB header and download software from NZXT's website for it, too.

6

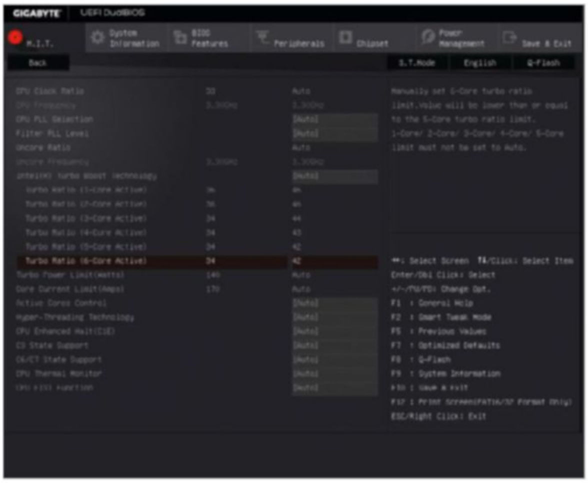
BEZEL REMOVAL

THIS NORMALLY WOULDN'T be a step we would bother mentioning, but just this once, we wanted to let those of you who are running optical drives in your Obsidian 750Ds know how to remove the bezel. If you're like us and can't read the manual, you might be tempted to pry off the front of the case, but hold back a sec as it's actually easier than that. The bezels are held in place rather tightly but can be removed by reaching inside the case and squeezing the two arms that secure it while pushing it out. It may seem like overkill but it's better than bezels that pop out every time you look at them too hard. With it out, just slide in your ODD. Also add your SSD and HDD and plug them into power and data.

7

OVERCLOCK IT

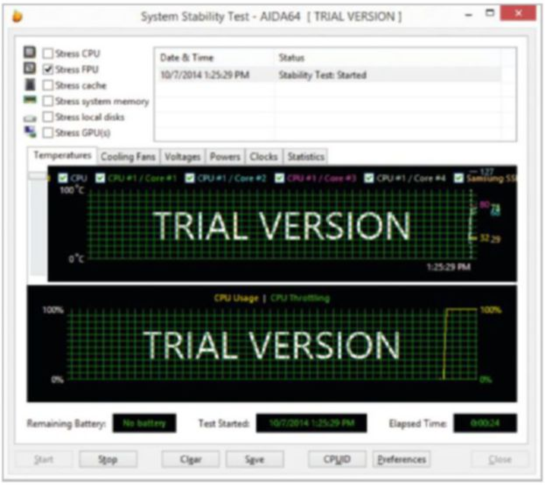
WITH THIS CPU and a nice liquid cooler, there's simply no reason not to overclock it. To start our overclock, we first consulted the Internets to get an idea of what others were getting from their retail CPUs and what methods they were using. Haswell-E has an additional "gear" or "strap" that allows you to run the bclock at higher than a standard Haswell chip's 100MHz, such as 125MHz. We, unfortunately, didn't get very far with that method and so, with the clock ticking on our build, we fell back on a basic Turbo Boost overclock. To do that, we went into the Advanced CPU Core settings in the UEFI and manually set the turbo ratios based on the core loads. To hit our overclocks, we also increased the core voltage to 1.296 volts.



8

VALIDATE!

VALIDATION OF AN OVERCLOCK'S stability is always an open debate. Is running your favorite game enough? We initially reached for our old standby: Prime95. We know board makers don't recommend it as it's "too stressful," but, for a quick test that gets you into the ballpark, we rely on it. However, it was too stressful on Haswell-E within a few minutes. Still needing to vet our settings, we used AIDA64 Extreme set to FPU mode and completed multiple runs. We'll note a recommended AIDA64 by some is 12 hours. When you're looking at 100MHz increments that means days of testing. We instead erred on the side of caution. We think Haswell-E can go further, but we wanted to be realistic about it, too.



System Stability Test - AIDA64 [TRIAL VERSION]

☐ Stress CPU
☑ Stress FPU
☐ Stress cache
☐ Stress system memory
☐ Stress local disks
☐ Stress GPU(s)

Date & Time	Status
10/7/2014 1:25:29 PM	Stability Test: Started

Remaining Battery: No battery
Test Started: 10/7/2014 1:25:29 PM
Elapsed Time: 0:00:24

INTEL'S "LITE" IS A HEAVYWEIGHT CONTENDER

FIRST, LET'S POINT OUT SOMETHING. The predecessor of the six-core Core i7-5820K is the four-core Core i7-4820K, which cost $325. When you factor in that you're getting the same core count of the $580 Core i7-4930K, this Haswell-E "Lite" is looking pretty damned good. To find out just how good, we took our zero-point system with its Sandy Bridge Core i7-3930K CPU overclocked full-time to 3.8GHz (on air) and its GeForce GTX 690 and put it against this month's build.

The result was pretty impressive. Remember, this is not a six-core chip wailing on a four-core part—the Core i7-3930K is a six-core chip that set you back $580 in its heyday and is no slouch in multi-threaded tasks. In the single-threaded tasks we saw the Build It with a 17 percent and 22 percent advantage. In multi-thread tasks the margin opens up further with a 27 percent advantage in Premiere Pro CS6 and a 29 percent advantage in the x264 HD 5.0 encoding test.

Part of that is from the clock-speed advantage. We are pushing the Build It PC to 4.2 to 4.6GHz depending on loads, which is around a 14 percent clock-speed advantage. The rest of the difference comes from the greater efficiency of the Haswell cores versus the older Sandy Bridge cores.

In gaming, the single GeForce GTX 690 is a dual-GPU card that's basically the equivalent of two GeForce GTX 680 cards in action. You can view this two ways: Man, that GeForce GTX 980 is fast if it can basically nip at the heels of a dual-GPU card that's still recognized as one of the fastest cards in town. Or, of course, you can also say: Man, that GeForce GTX 690 still packs some heat if it's faster than the GeForce GTX 980 card.

The real question is: Is it worth an upgrade? That depends on your needs. If cutting your multi-hour encodes down by a third is money saved and you want a modern chipset in X99, then yes. For many people who put down nearly $600 for a six-core Sandy Bridge part, though, that is still a viable part. ⏻

BENCHMARKS

	ZERO-POINT	
Premiere Pro CS6 (sec)	2,000	1,580
Stitch.Efx 2.0 (sec)	831	711
ProShow Producer 5.0 (sec)	1,446	1,184
x264 HD 5.0 (fps)	21.1	27.3
Batman: Arkham City (fps)	76	72 (-5%)
3DMark 11	5,847	5,706 (-2%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79.

TECHNICIANS OF THE WORLD, REJOICE!

A BETTER MULTIPURPOSE SOLUTION HAS ARRIVED!

Windows
Premium
UAV
ULTRA-X, INC.
QuickTech Shop
ULTRA-X, INC.
Web: www.uxd.com
E-Mail: info@uxd.com
Copyright 2014, Ultra-X, Inc.
Santa Clara, Ca USA

MADE IN THE USA!

The new **QuickTech Shop** 3-in1 business solution provides powerful and accurate *professional-grade tools* service technicians demand. It offers everything you'll need to solve the most common problems maximizing your technician's efficiency and increasing overall product and service quality.

Service an unlimited number of desktops, notebooks, tablets, or other PC compatible systems - one at a time for a single annual fee.

QUICK. SIMPLE. ACCURATE.

- BOOTABLE DIAGNOSTICS
- BOOTABLE MALWARE REMOVAL
- MULTI-POINT ASSESSMENT
- STRESS TESTING
- PROFESSIONAL REPORTING
- TROUBLESHOOTING WIZARD

Web uxd.com

ULTRA-X, INC.
SINCE 1987

GET MORE INFO:
1-800-722-3789
www.UXD.com

MENTION PROMO CODE: QTSHOP31
SAVE 10%
Limited time offer expires 11/31/2014. Cannot be combined with any other discount or promo code. Promo code applies only to QuickTech SHOP

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

INSIDE

72 Origin Chronos Z

74 Acer C720-3404

76 MSI GeForce GTX 980 Gaming 4G

79 Logitech G402 Hyperion Fury

80 Asus Strix Radeon R9 285

83 Corsair Vengeance LPX 16GB DDR4

84 MSI GS70 Stealth Pro-210

86 Dell XPS 18

89 Samsung 850 Pro

90 Middle-Earth: Shadow of Mordor

92 Lab Notes

ORIGIN CHRONOS Z
PAGE 72

Believe it or not, the Chronos Z is almost a bargain.

Origin Chronos Z

Tiny but loud computing

IT'S HARD TO BELIEVE it's been two years since we marveled at the first modern "micro-tower" and how much performance you could cram into the tiny space.

We then promptly bashed it for not having "enough." You know, like dual-card performance or more than 1TB storage. Fast forward two years and we have the latest challlenger in Origin's new Chronos Z. As the "Z" implies, this slightly-bigger-than-an-Xbox 360 features Nvidia's GeForce GTX Titan Z inside. While people snicker at the Titan for being overpriced and underperforming, it's the only answer for those wanting dual-GPU performance in a tight space. Elsewhere, Origin PC manages to put Intel's top LGA1150 proc, the Core i7-4790K, in place with an overclock that ranges from 4.4GHz to 4.8GHz using a customized Asetek 550LC CLC. To get the 550LC into the SilverStone RVZ01 chassis, Origin had to use a very narrow fan. Although we had concerns about how effective it would be—our own Build It experience on the same chassis and a CLC was disappointing—the Chronos Z was fine.

The amazing thing here is that Origin PC stuffs the Titan Z in at all. It's technically a three-slot card, but it will fit into two slots with a different backplate. Not that this is the first time we've seen a Titan Z in a micro-tower—Falcon crossed that off the PC-builder bucket list back in September, with its Tiki Z. However, Falcon's case is custom-built to its specs. For the most part, the chassis Origin PC uses appears to be off-the-shelf and varies little from the stock SilverStone RVZ01.

TAKING ON THE TIKI

That is perhaps one area where the Chronos Z is at a disadvantage against Falcon's Tiki Z. With this much hardware inside, thermals are a major obstacle to overcome. Adding to that is the cooler design of the Titan Z. Single-GPU cards intake air and blow it out the rear of the card. The dual-GPU design on the Z, however, intakes air in the middle and blows it out of the back *and* front of the card inside the system.

Where Falcon successfully modified its chassis to exhaust all of the hot air, the Chronos Z has to eat some of the hot exhaust in the chassis. And to keep the Titan Z cool, Origin aims the two slim 120mm fans on the starboard side of the system at the GPU. The other slim 120mm mounted to the liquid cooler on the port side is also set to intake air. The end result is a system that gets a little loud under heavy GPU loads. It's not terrible and probably no louder than last month's Polywell X99 box, but we've been spoiled by insanely powerful gaming rigs that are crazily quiet.

The good news is that performance is where it should be—it eats our zero-point box in all jobs except for multithreaded tasks. Even there, it's but 10 percent slower than that box's six-core Sandy Bridge part, and the Titan Z destroys the GeForce GTX 690, too. Up against the Tiki Z, it's pretty much a tie with a 3 to 4 percent edge going to the Chronos Z in gaming performance. That's not a lot, but it is a difference. The problem is what you pay for in acoustics next to the Tiki Z, which is shockingly quiet for its performance.

The Tiki Z was also shockingly pricey, too, at $7,500. Some of that comes from the 2TB of SSD and fancy paint job, but it means the $4,800 that Origin wants is practically a "bargain," in some alternative use of the word. –**GORDON MAH UNG**

VERDICT 7

Origin Chronos Z

+ DREAM MACHINE Fast; small; cheaper than comparable micro-towers.

− SCREAM MACHINE Expensive; too loud under gaming loads.

$4,800; www.originpc.com

BENCHMARKS

	ZERO-POINT	
Premiere Pro CS6 (sec)	2,000	2,212 (-10%)
Stitch.Efx 2.0 (sec)	831	721
ProShow Producer 5.0	1,446	1,216
x264 HD 5.0 (fps)	21.1	19.2 (-9%)
Batman: Arkham City (fps)	76	146
3DMark 11	5,847	9,194

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K overclocked to 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We're running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

SPECIFICATIONS

CPU	Intel Core i7-4790K overclocked at 4.4GHz to 4.8GHz
Mobo	Asus Z97I-PLUS
RAM	16GB Origin PC/Kingston DDR3/1866
GPU	Nvidia GeForce GTX Titan Z
Storage	1TB Samsung 840 EVO, 4TB Samsung SSHD
Optical Drive	BD-R burner UJ265
Case/PSU	SilverStone RVZ01 / 700-watt SFX PSU

When you need real performance in a Chromebook, look to the Acer C720-3404.

Acer C720-3404

Powerful, but why?

POWERFUL *AND* CHROMEBOOK? That's about as useful, to be crude, as a right-mouse button on a Mac. And yet that's what Acer is pushing on the latest iteration of its C720 notebook. You'll recognize the model number, of course, as we've reviewed it before and have long recommended it as our Chromebook pick for its performance, cost, and battery life.

That previous C720's full name—C720-2800—had a Haswell-based 1.4GHz Celeron 2955U without Hyper-Threading. For its time, the Celeron 2955U offered pretty spectacular performance in a Chromebook without the compromises that Atom-based and ARM-based Chromebooks suffered. Acer basically took that notebook and, instead of the Celeron, installed a Haswell-based 1.7GHz Core i3-4005U. This chip has 3MB of L2 cache and Hyper-Threading, and has a list price almost three times that of a Celeron 2955U part.

Since performance was a primary lever here for Acer, we decided to benchmark it against the Celeron C720 and Google's gray-haired and überexpensive Google Pixel. The Pixel, of course, packs a 1.8GHz Core i5-3427U, which is based on the older Ivy Bridge microarchitecture. Its two cores have Hyper-Threading switched on, and it has a Turbo Boost speed of 2.8GHz.

One thing to note: We can only run browser-based benchmarks on Chromebooks and that means it has to be connected to the Internet. Normally, that's not a problem, but Google likes to drop OS and firmware updates without warning, and that can have huge impacts on performance. So, we're using the Chromebooks with the latest OS and browsers available to them. Even with the older Ivy Bridge chip in it, the higher Turbo Boost of the Google Pixel put it ahead in most tests, but not by the margin you'd expect. The upshot of our performance testing is that the newest Acer C720 may well be worth paying for if you really need more out of your Chromebook but don't want to pay for a Pixel.

GETTING TANKED

The world isn't all about benchmarks, though. We also put the Chromebooks though some "hot" gaming action, which on a Chromebook means Flash-based gaming in the incredibly popular *Tanki Online*. Using separate accounts, we threw the Chromebooks into the same *Tanki Online* server match and then adjusted the graphics settings manually. There's no benchmark but there is an active frame rate counter. For the most part, the Celeron-based C720 and the Google Pixel sat in the low 30s. The new Core i3 C720 with its HD4400 integrated graphics managed to put out 50 to 60 frames a second in the same match. Winner: Haswell.

We also conducted a multitab test by pointing the three Chromebooks to the same 17 media-heavy websites and then scrolled down the page on each, side by side. All passed. You'd think this would be easy, but on Arm-based Chromebooks we haven't done it without massive stuttering. (We patiently await Acer's Tegra K1-based Chromebook, of course.) Our last test was a battery run-down test using the Futuremark Peacekeeper battery run-down test. The test is more CPU-intensive than streaming video and probably a worst-case scenario for a Chromebook, though, so we'd expect perhaps a third or more battery life if you're just watching video and even more if just running email. The Celeron C720 took the lead here by a healthy margin, with Pixel and its high-resolution screen only giving up 200 minutes of run time. The rest is the same as the previous C720, though: The TN screen is meh, the keyboard and trackpad fair, and the looks are downright boring.

Overall, the new Core i3 720P gives up a lot of performance when compared to the Google Pixel, but ultimately, do you really need to pay for it? The Celeron C720 with 4GB of RAM is $330. You'll need to pony up another $50 for the Core i3 part. Once you've done that, you'll realize you just put up almost $400. That seems like a bit too much for a Chromebook as it's close enough to get you to a "real" laptop. Frankly, for most people, the Celeron C720-2800 with 4GB is probably the most they'll ever need for a Chromebook, and a better deal. **–GORDON MAH UNG**

BENCHMARKS

	Acer C720-3404	Acer C720-2800	Google Pixel
CPU	Intel 1.7GHz Core i3-4005U	Intel 1.4GHz Celeron 2955U	Intel 1.8GHz-2.8GHz Core i5-3427U
Graphics	Intel HD4400	Intel HD Graphics	Intel HD4000
RAM	4GB DDR3	4GB DDR3	4GB DDR3
OS	5978.98.1	5978.98.1	6158.56.0
Web Browser	37.0.2062.120	37.0.2062.120	38.0.2125.101
SunSpider 1.02 (ms)	373.6	463.7	**339.8**
Google Octane V2	14,333	11,564	**19,127**
Peacekeeper	2,863	2,411	**3,851**
Wirple	**1,593**	748	1,124
Kraken 1.1	2,119.4	2,600.7	**1,665**
OortOnline.Gl	4,250	3,060	**4,490**
File Copy Across USB 3.0	**96**	102	112
Battery Run Down (min)	312	**355**	200

Best scores are bolded.

VERDICT 7

Acer C720-3404

REAL BOOKS Gives even the Google Pixel a genuine run for the money.

IBOOK Relatively pricey for a Chromebook.

$380, www.acer.com

MSI GeForce GTX 980 Gaming 4G

A quiet riot of a card

DRAGON ARMY

MSI offers a software widget to customize fan speed.

THE ARRIVAL OF THE NVIDIA GeForce GTX 750 and 750 Ti a few months back marked an interesting new plot twist in the video card wars—greatly reduced power consumption. In the AMD versus Nvidia arms race, greater performance and wattage usually go hand in hand. But with Nvidia's GTX 980, we've a card pulling up to 165W (without overclocking), compared to 250W for its 780 Ti, and 290W for AMD's Radeon R9 290X. This difference has a profound effect on cooling and fan acoustics.

MSI is using its "Twin Frozr V" cooler design on this new card. That means dual customized 100mm fans, several large nickel-plated heatpipes running through a plate that sits atop the GPU, and a heatsink that goes the length of the card. There's also a heat spreader covering part of the PCB, sandwiched in between the heatsink and the card. It's overkill, but not the bad kind.

This cooling is so good that the fans don't even spin up when the card is idle. It tops out at 42 C in our lab, which has an ambient temp of about 21 C. Under load, we couldn't get it hotter than 67 C, and the fans were still near-silent, spinning almost casually at 1,100rpm. This is with a 100MHz core overclock out-of-the-box, by the way. In contrast, the reference 980 will climb up to 80 C under load, at stock clock speeds, at which point its single fan is programmed to spin higher and higher. If that's not enough, the reference card begins lowering its clock speed. Third-party coolers are almost always better, but we've never seen a difference this stark.

The OoTB overclock is mild, but it's enough for a 5–10 percent performance rise across the board, for a GPU that's already one of the world's fastest. Our 3DMark *Fire Strike* score only went up by a few hundred points, which is arguably within the margin of error. But every actual game benchmark we tested gave us consistently higher frame rates. In *Tomb Raider* at 2560x1600, we hit 53fps with pretty much every visual effect maxed out, versus 46fps for the reference card, an increase of nearly 15 percent. Disabling TressFX (AMD's intensive hair physics modeling) got us a sustained 63fps at 1600p, which has more than twice the pixel count of 1080p. That's pretty impressive for a single GPU.

STANDING TALL

There are a couple of downsides, but they're mild. The reference card, for example, uses two 6-pin PCIe cables, but the MSI version uses two 8-pin connectors. There are some power supplies out there with just one 8-pin and one 6-pin. MSI includes an adaptor in the box, but a certified 8-pin cable is preferable, for safety reasons. The card is also about an inch taller than the reference model (to accommodate MSI's 100mm fans), so the screw for the card slot is a little trickier to install. The fan nearest to the PCI power connectors is also a millimeter or two taller than the farther one, so some SLI configurations may leave it a bit starved for intake. But all in all, these are not major issues. The 980 Gaming 4G's eye-popping performance and acoustics can make up for a lot of relatively minor issues.

This card's biggest problem is actually the GeForce GTX 970, which is priced over $200 lower and is absolutely no slouch. While we have our first hands-on with the 970 on page 48, we've yet to put these two platforms head-to-head in the Thunderdome. We hope to soon, so we can really see how the landscape looks. In the meantime, it's definitely a factor worth considering before you drop $570. **–TOM MCNAMARA**

SPECIFICATIONS

CUDA Cores	2048
Core Clock	1,216MHz
Memory Clock	7,000MHz
Memory Interface	256-bit
Memory Type	GDDR5
Connectors	2x 8-pin
Ports	1x DVI-I Dual-Link, 1x HDMI 2.0, 3x DisplayPort
Dimensions (H x D x W)	5.5 x 1.4 x 11 inches
Weight	1.72 lb

VERDICT 9 KICK ASS

MSI GeForce GTX 980 Gaming 4G

+ CHOCOLATE MILK High-end performance and design; very quiet.

− CHOCOLATE SODA On the expensive side; slightly tricky to install.

$570, www.msi.com

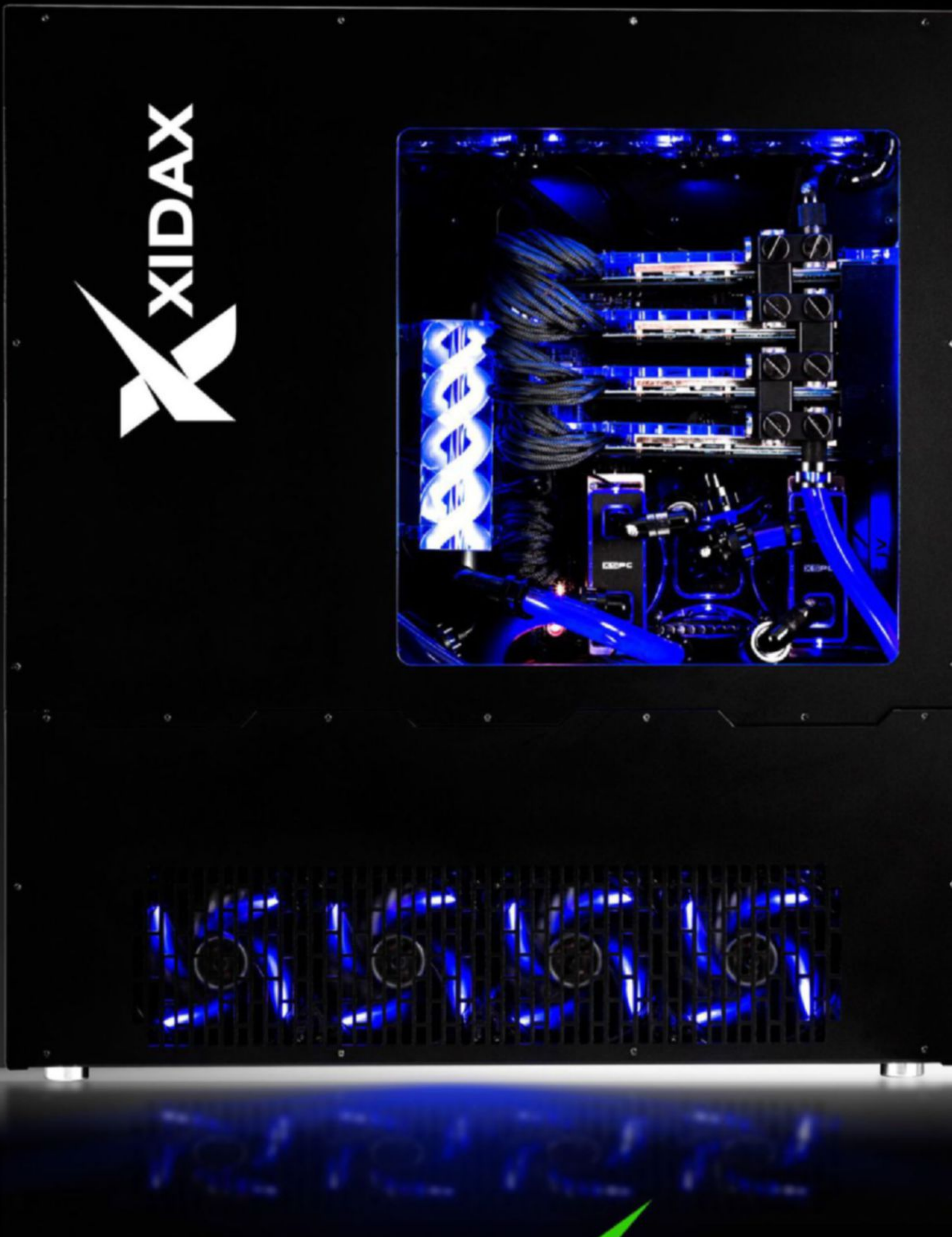
BENCHMARKS

	MSI GeForce GTX 980 Gaming 4G	**Asus ROG Matrix Radeon R9 290X**	**Sapphire R9 290 Vapor-X OC**	**Gigabyte GTX 780 GHz Edition**	**GTX 780 Ti**
Tomb Raider (fps)	**35**	26	25	25	26
Metro: Last Light (fps)	**53**	30	29	25	32
Batman: Arkham Origins (fps)	**80**	65	62	71	78
Hitman: Absolution (fps)	43	**51**	49	45	46
Unigine Valley 1.0 (fps)	47	41	39	**48**	**48**
Unigine Heaven 4.0 (fps)	**42**	33	34	39	39
3D Mark Fire Strike	**11,480**	9,837	9,602	9,695	9,976
Price (street)	$570	$630	$470	$340	$650

Best scores are bolded. Our test bed is a 3.33GHz Core i7-3960X Extreme Edition in an Asus Rampage IV Extreme motherboard with 16GB of DDR3/1600 and a Thermaltake ToughPower 1,050W PSU. The OS is 64-bit Windows 8.1. All games are run at 2560x1600, except for Fire Strike.

Say hello to the X-10

The Ultimate Watercooled PC



www.xidax.com

Elite Rigs Starting at $799

Enter coupon code MAXPC for 5% off this month!

XIDAX
ELITE RIGS

The 32-bit ARM core means the G402 is crazy fast, despite maxing out at just 4,000 dpi.

Logitech G402 Hyperion Fury

The perfect rodent for the FPS crowd

LOGITECH HAS COME UP with some fascinating claims for its two latest gaming mice. First was the G502 Proteus Core, with the highest possible dpi settings available in any laser rodent, living or dead. Now we've got the G402 Hyperion Fury lining up as the world's fastest gaming mouse. Phew. So, first off Logitech turns up with a mouse capable of hitting a max dpi of 12,000, and now we've got something even faster. How is such technical voodoo possible?

It's possible because we're not talking about higher dpi settings equating to a faster gaming mouse. As you'll see from the specs list, this Hyperion Fury is actually only capable of a max dpi of some 4,000. That's because, with the G402, Logitech isn't equating sensitivity with speed.

It's actually talking about how quickly the sensor is able to track the physical movement of the mouse, and the Hyperion Fury is capable of tracking at speeds of up to 500 inches per second (ips). That's seriously quick. And yes, that is faster than the G502, which has a maximum tracking speed of 300ips.

FAST TRACK

The reason this gaming rodent is so pacey is because of the Fusion Engine sensor at its heart. It's called a hybrid sensor because it's not simply relying on optical sensors to track the movement of the mouse across a given surface. It's also using a built-in accelerometer and gyroscope.

The issue is that if a mouse moves quicker than the optical sensor alone can track, you lose accuracy and consistency of movement in-game. That's not a problem with the clever lil G402 because the accelerometer and gyroscope are connected to a 32-bit ARM core, and are able to predict where the mouse is heading if the laser sensor loses track of it. Basically, it means it's pretty much guaranteed you won't be able to shift the G402 around your desk quicker than it can track.

And it all translates into a gaming mouse that's incredibly reliable and accurate in the heat of virtual battle. We're usually fans of relatively high dpi mice, such as the RAT TE—not necessarily at the top 8,200, but certainly higher than the 4,000 dpi the G402 maxes out at. Yet when you've got such a reliable translation of motion from the mouse to your in-game avatar, you really don't need such extreme sensitivity in your mouse.

In terms of aesthetics, the G402 is very much the younger sibling of the G502. It's got a similar long chassis, but lacks the width of the G502. The G402 is a simpler design. That doesn't do it a disservice, but we'd be happier having this Fusion Engine strapped into the glorious old Logitech G9 chassis. Still, this is a fantastic mouse, offering possibly the most precise and consistent FPS gaming experience we've ever had. –DAVE JAMES

SPECIFICATIONS

Control	8 programmable buttons
Max dpi	4,000
Connection	Wired
Response Rate	1ms
Sensor	Fusion Engine hybrid
Processor	32-bit ARM

VERDICT 9

Logitech G402 Hyperion Fury

+ **CALL OF DUTY** Very fast; cleverly designed for accuracy and consistency.

− **FOOL OF DUTY** Chassis could be wider.

$60, gaming.logitech.com

Asus Strix Radeon R9 285

AMD's newest Radeon tech runs the gauntlet

With the 285's boosted power efficiency, it needs only two six-pin PCIe cables.

AMD SEEMS TO LIKE THE SHOTGUN METHOD, churning out a series of Radeon video cards with fairly incremental differences. The R9 285 is its latest salvo, fitting between the 280 and 280X in performance and price. The company didn't say this card is supposed to *replace* its nearest neighbors, but we get the impression they'll be discontinued by the time you read this. Yet those cards are not the ones in AMD's crosshairs. That honor belongs to the Nvidia GeForce GTX 760. With an MSRP of $230, it sat in a particular spot where AMD was not competing until now (minus the occasional mail-in rebate). And as far as we can tell, AMD's aim is true. In short, the R9 285 is a stronger performer for about the same price.

In the lead-up to the card's release, AMD talked up its 3DMark performance. We were able to confirm its numbers, and the R9 285 shoots the GTX 760 out of the sky. But 3DMark is a synthetic benchmark, and its four or five digit scores can make differences look larger than they are in real-world testing. So we ran a series of game benchmarks, such as *Tomb Raider*, *Hitman: Absolution*, and *Metro: Last Light*. In nearly every instance, the 285 maintained a meaningful and consistent lead. *Hitman* lagged behind, but it looked like an issue of beta drivers, because the card was fine everywhere else.

Then there's the question of software quality. For years AMD has had to wrangle with the perception that its drivers were buggier than Nvidia's. And now its competitor has the GeForce Experience package, which has nice video recording features and one-click performance optimization. But in recent months, AMD's own "Gaming Evolved" software has become roughly equal. Suddenly, when you also consider AMD's aggressive price-performance ratio, Nvidia's edge isn't as clear.

TONGA TIME

Let's also talk about this Asus card in particular. It draws about 190 watts under load, versus about 225 watts for the R9 280 (and 170 watts for the GTX 760, Nvidia's most comparable card). This improvement over the 280 allows the new card to run more quietly. Only a single fan operates when you're not gaming or otherwise stressing the GPU. And the fan doesn't even start moving until the chip hits 62 degrees Celsius. Under load, the card didn't get past 72 C in our testing, and we could barely hear its fans working. And this is with a factory overclock that increases the GPU's core clock speed from 918MHz to 954MHz. These gains come from AMD's new "Tonga" generation of GPUs, which are an evolution of the Hawaii generation in its more powerful (and power efficient) R9 290.

The card's metal shroud probably also helps with heat dissipation. (Sometimes this element is made of plastic to cut costs.) This adds weight, but Asus pre-installs a backplate, which reinforces the Strix 285 to prevent it from sagging. This card is also taller than most, though, which partially blocks the spot where you screw it down. It's not bad enough to deduct a point from our score, but it's worth mentioning. Bring a screwdriver with a magnetic tip.

By the time you read this, Nvidia will have already released its high-end Maxwell cards, but they don't compete in this price range. The least expensive, the GTX 970, has an MSRP of $330, and it was extremely difficult to find in stock as this issue went to press anyway. We haven't heard any whispers yet about a GTX 960. Until then, the Radeon R9 285 is the king of the $200–$250 cards. **–TOM MCNAMARA**

SPECIFICATIONS

Video Memory	GDDR5 2GB
Engine Clock	954MHz
Memory Clock	5,500MHz
Memory Interface	256-bit
PCIe	2x 6-pin
Form Factor	Dual slot
Ports	DVI-I. DVI-D, HDMI, DisplayPort
Dimensions (H x D x W)	5.5 x 1.6 x 10.6 inches
Weight	1.89 lb

VERDICT 9 KICK ASS

Asus Strix Radeon R9 285

➕ **HABANERO** Great price for the performance it delivers; cool and quiet; sturdy.

➖ **BELL PEPPER** It's slightly tricky to install.

$250, www.asus.com

BENCHMARKS

	Asus Strix Radeon R9 285	XFX Radeon R9 280	Asus Radeon R9 280X	Asus GeForce GTX 760 Mini
Tomb Raider (fps)	33	31	**35**	24
Metro: Last Light (fps)	33	31	**35**	27
Batman: Arkham Origins (fps)	66	56	69	**75**
Hitman: Absolution (fps)	29	**52**	49	42
Unigine Valley 1.0 (fps)	50	47	**62**	48
Unigine Heaven 4.0 (fps)	43	37	**44**	35
3DMark Fire Strike	7,176	6,880	**8,003**	5,746
Price (street)	$250	$230	$310	$220

Best scores are bolded. Our test bed is a 3.33GHz Core i7-3960X Extreme Edition in an Asus Rampage IV Extreme motherboard with 16GB of DDR3/1600, and a Thermaltake ToughPower 1,050W PSU. The OS is 64-bit Windows 8.1. All games are run at 2560x1600, except for *Fire Strike*.

UFC
3
BUD LIGHT

SUBSCRIBE

GO TO UFC.COM/MAGAZINE
TO SUBSCRIBE NOW!

Corsair Vengeance LPX 16GB DDR4

Taking RAM to new heights

The Vengeance might be fast, but can it justify its price?

AS SOMEONE WHO might have been Francis Bacon once said: "I am in blood stepp'd in so far that, should I wade no more, returning were as tedious as go o'er." He wasn't actually talking about some battle for a Scottish throne, he was referring to the fact that once you've spent a vast sum of money on a new X99 motherboard and Haswell-E processor, it's as boring shopping about for a cheap memory kit as it is just dropping another fortune on a high performance Corsair set. Prescient guy, that Bacon.

Such weariness probably has something to do with the fact your choice of memory module won't make a huge difference to the overall PC experience, either. That's going to be the tough ask for manufacturers of high-performance DDR4 memory modules in this new frontier of RAM, where even the cheap stuff has to match the new Intel platform's 2,133MHz starting point. Across four modules for the true quad-channel experience, you're already talking about some seriously quick memory.

EASY DOES IT

So what can faster stuff like the Corsair Vengeance kit do that a slightly slower Crucial DDR4 kit can't? The obvious answer is "pretty much nothing." You can quickly get a picture of which of these kits is the higher-performing through synthetic benchmarking, but in real terms it's far harder to see any performance difference. We would say that thanks to the added little heatspreader Corsair has gone with for its Vengeance kit, we would expect it to last longer, but given the fact that both of these sets have lifetime warranties from some suppliers, that's close to becoming a moot point, too.

What the higher-spec Vengeance kit can offer, though, is XMP 2.0. And what does XMP stand for? Ease-of-use. OK, the acronym doesn't work, but with XMP you don't have to worry about digging into the BIOS to get the best out of the kit, as you can set the modules to run at their quoted box settings from most BIOS front pages.

At 2,800MHz, this Vengeance set offers a huge amount of memory bandwidth on our i7-5960X test machine, and posts the best performance numbers in all our tests bar memory latency. Corsair has also included a memory profile to run the kit at 3,000MHz—while still only hitting 1.35v—but strangely, the performance after 2,800MHz drops off quite considerably. It almost goes down to its 2,133MHz base and explains why Corsair isn't selling these modules at the higher clockspeed.

In head-to-head tests, this Corsair kit is clearly the better set of memory modules, but we do have to think about price. You're not really getting a lot more, in real terms, by paying the price premium. That said, compared to the previous generation of memory, there's not a huge premium shifting up to DDR4 anyway. In fact, you wont find a 16GB DDR3 kit rated at 2,800MHz any cheaper than these Corsair modules. In those terms, you may be paying through the nose, but this kit is good value as this level of RAM performance is unprecedented at this price. These are leaner, cheaper, quicker modules than the last generation. The problem is, that doesn't matter right now. –**DAVE JAMES**

BENCHMARKS

	Corsair DDR4 2,800MHz	Crucial DDR4 2,133MHz	Corsair DDR3 2,133MHz
Memory Bandwidth			
SiSoft Sandra (GB/s)	54.6	45.8	**50.8**
Compression Performance			
WinRAR (KB/s)	**18,851**	17,781	14,476
Memory Copy Performance			
AIDA64 (MB/s)	**62,217**	52,178	55,877

Best scores are bolded.

VERDICT 8

Corsair Vengeance LPX 16GB DDR4

⊞ **LEAN MACHINE** Better value than equivalent DDR3 kits, with all the DDR4 goodness; sexy heatspreaders; user-friendly XMP 2.0.

⊟ **MEAN MACHINE** It's a lot of money for something you don't really need.

$375, www.corsair.com

The MSI's thin profile means loud fans.

MSI GS70 Stealth Pro-210

Not so stealthy

IN AN IDEAL WORLD, a gaming laptop would be powerful, have a large screen, and still be portable. Oh, and how about running stealthily quiet? Until now, no manufacturer has been able to marry these qualities together, but MSI is attempting to win us over with its latest offering.

The GS70 Stealth Pro offers a 17.3-inch panel but is relatively portable, weighing a little over six pounds and measuring a svelte 0.8-inches thick. So far, so good. But here comes the downside. The monitor is a standard 1080p TN panel. Its viewing angles aren't horrible for a TN, but overall, it's lackluster when considering the current UHD/IPS/touch-monitor renaissance.

We had no qualms about the GS70's SteelSeries keyboard, which offers three customizable colored LED lighting zones. It's not as fancy as an Alienware laptop, but if you want it to dazzle with a multicolored setup, there's plenty of flash to go around. Nestled above the keyboard are the Stealth's Dynaudio speakers, which sound great and offer tons of firepower.

Speaking of firepower, the laptop's internal components aren't too shabby, either. There's a good amount of storage with two 128GB SSDs in RAID 0 coupled with a 1TB HDD for mass storage. In terms of processing power, we've got a 2.5GHz Core i7 4710HQ CPU, 16GB of RAM, and a GeForce GTX 870M with 6GB of GDDR5 VRAM. When the time came to perform, the CPU proved a little gun shy, and traded small cuts and bruises with our zero-point's Core i7 4700MQ, which is clocked 100MHz lower. Still, our ZP is the much thicker Alienware 14 and thus has more legroom to run at its max 3.5GHz turbo frequency.

The same could not be said about GPU performance. Here, our zero-point AW14's GTX 765M is really showing its age. The Stealth Pro's nearly 2x CUDA core advantage, coupled with its nearly 100MHz faster graphics clock, allowed it to run roughly 60–80 percent faster in our GPU benchmarks. What this means in real-world terms is silky-smooth frame rates playing most games maxed out. In *Bioshock Infinite*, a moderately intensive game using the Unreal Engine 3, we garnered an average fps in the mid 70s with all the bells and whistles enabled. But you shouldn't expect all games to run this way. To put the notebook through its paces, we played the super graphically intensive *Metro: Last Light* at max settings and our average was an unimpressive 13fps average. It just goes to show that more powerful desktop GPUs aren't going anywhere.

TOO HOT TO HANDLE

Though the Stealth Pro is still quite powerful for a notebook, it comes at a cost. With great power comes great heat (in a thin notebook), and this thing is loud. It's not leaf-blower loud, but it teeters on the edge of tolerability, and the fans really go on the offensive under load. Another drawback is that it exhausts heat on the right side of the notebook. Considering most people are right-handed, this could amount to some warm fingers. The exhaust is tucked away on the far corner, but a less offensive design would be to exhaust heat from behind the monitor, like the Asus ROG G750 does.

While you're getting a relatively portable notebook with a large screen that's also pretty powerful, you're also getting the heat and the noise that comes with it. By the time you're reading this, notebooks with Nvidia's latest GeForce GTX 980Ms and 970Ms should be hitting the shelves. Even though at $1,900 our Stealth unit is fairly priced, we suggest holding off to see if some of these issues aren't at least mitigated before you buy. –**JIMMY THANG**

SPECIFICATIONS

CPU	2.5GHz Intel Core i7-4710HQ
RAM	16GB DDR3/1600
Chipset	Intel HM87
GPU	Nvidia GeForce GTX 870M
Display	17.3-inch, 1920x1080 TN display (matte)
Storage	1TB (7,200rpm), 256GB SSD (two 128GB SSDs in RAID 0)
Connectivity	Ethernet, HDMI, media card reader, 4x USB 3.0, mic input, headphone input, 2MP webcam, Bluetooth 4.0, 802.11ac
Lap / Carry	6 lbs, 10.1 oz/ 7 lbs, 8.7 oz

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	962	980 (-1.8%)
Proshow Producer 5 (sec)	1,629	1,598
x264 HD 5.0	13.5	13.1 (-3%)
Bioshock Infinite (fps)	36.1	67.3
Metro: Last Light (fps)	30.4	55.3
3DMark 11 Perf	4,170	6,755
Battery Life (min)	234	200 (-14.5%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

VERDICT 8

MSI GS70 Stealth Pro-210

➕ **STEALTH BOMBER** Great GPU performance; good amount of fast storage; relatively portable.

➖ **NOISY CRICKET** Hot; loud; average CPU performance; 1080p TN panel.

$1,900, www.msi.com

DELL
Start
McAfee Central
kindle
New to the Store
Dell Shop

Improvements include a Haswell CPU and dedicated SSD.

Dell XPS 18

A step in the right direction

IF YOU RECALL from our first Dell XPS 18 review in the August 2013 issue, we were surprised by how much we liked the 18-inch AIO/tablet hybrid. As much as we enthused, however, there were a few issues that kept us from recommending it outright. Haswell was right around the corner, which would have offered better CPU, GPU, and battery performance over its then aging Ivy Bridge processor. We also didn't like that it only had a paltry 32GB caching drive. With the XPS 18 Mark II, Dell is attempting to address those issues.

Aesthetically, it uses the exact same design as its predecessor, with a chassis measuring 11x18.2x0.6 inches. It has a one-inch bezel around its glossy 1080p display. The 10-point capacitive touchscreen uses an IPS panel and still looks as good as ever. While its 5lb weight doesn't make it as portable as a traditional tablet, it is lighter than most gaming laptops we've reviewed. It also has two feet that kick out, so you can either use it standing on a desk or flipped to lay nearly flat. Our unit also came with a stand that raises it 3.5 inches off the table and gives you about 40 degrees of tilt, so you could use it standing up.

Another nice thing about the stand is that it conveniently has space beneath it that allows you to stow away the included wireless keyboard and mouse. Both devices are Bluetooth and, unlike most other AIO peripherals, don't take up USB ports. This is appreciated, especially considering the XPS 18 only offers two USB ports. The only other ports you'll see include the headphone jack and SD card slot. One thing we criticized about the original XPS 18 was that it lacked ports, and unfortunately, that hasn't changed. We'd have liked to at least see an HDMI-out so we could beam the feed up to an HDTV if need be.

FRAME RATE FAIL

Luckily, improvements have been made under the hood. Our configuration sported a 2GHz Core i7-4510U along with 8GB of DDR3. There's still no discrete GPU this time around, but it's excusable in this relatively portable form factor. Compared to its Ivy Bridge predecessor, it performed roughly 47 better in 3DMark 11. While that sounds fantastic, it's really more of a reminder of how bad Ivy Bridge's integrated graphics were. When we fired up Valve's *Left 4 Dead 2*, a notoriously non-taxing game to run, we hit an average 13fps trying to max out the game. Ouch!

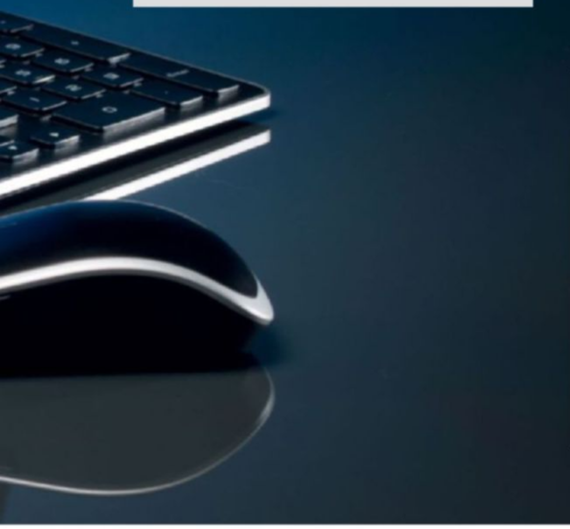
So, the Dell XPS 18 is still far from a gaming rig. Compared to our zero-point's 630M, which is by no means a great mobile GPU by today's standards, it still got its butt handed to it, losing by 30–50 percent. CPU-side, it performed up to 20 percent better than its old XPS 18 Ivy Bridge counterpart, but compared to our ZP's 3GHz Core i5-3330 Ivy Bridge CPU, it lost by 15–42 percent. It just goes to show that clock speed still matters and that a newer CPU microarchitecture doesn't mean all that much if it's stuffed into a thin form factor that can't accommodate high TDPs. One key addition Haswell does bring to the table is improved battery life. Compared to its predecessor, its battery life increased by roughly 50 minutes, bringing the total to 255 minutes in our video run-down test, which is great.

Another improvement is the 256GB SSD, which allowed the AIO to boot up in 14 seconds, or roughly half the time the original XPS 18 and its HDD took to boot. We do wish it came with a bigger SSD, however, preferably one twice the size, but we suppose external drives are always an option.

The new Dell XPS 18 isn't perfect and it makes some compromises as a result of its hybrid form factor, but it largely implements the changes we requested the first time around to deliver some modest improvements across the board. In the end, however, if you're considering the XPS 18, it's probably because you're looking for an AIO that you can move from work to home to possibly play with the kids, and in that regard, the XPS 18 currently has no equal.
–JIMMY THANG

SPECIFICATIONS

CPU	2GHz Intel Core i7-4510U
GPU	Intel HD Graphics 4400
RAM	8GB DDR3
Storage	256GB SSD
Optical	N/A
Display	18.4-inch 1920x1080 IPS touch-screen (glossy)



VERDICT 9

Dell XPS 18

➕ **HASWELL** Good battery life; improved CPU and GPU performance; SSD.

➖ **HAS-BEEN** Performance gains are a little weak; lack of ports; relatively small SSD.

$1,500, www.dell.com

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	1,192	1,860 (-35.9%)
Proshow Producer 5 (sec)	1,841	2,177 (-15.4%)
x264 HD 5.0	9.9	5.7 (-42.4%)
Metro 2033 (fps)	22	10.3 (-53.2%)
3DMark 11 Perf	1,333	941 (-29.4%)

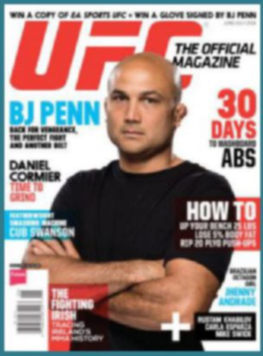
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point all-in-one PC is an Asus ET2300 with a 3.0GHz Intel Core i5-3330M, 8GB DDR3/1600, 1TB 7,200rpm hard drive, a GeForce GT 630M, and Windows 8. *Metro* tested at 1280x768 with Medium settings, Tessellation enabled.

★ SEASONAL SAVINGS ★

- On Magazine Subscriptions -

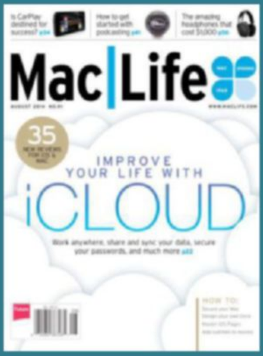
THE PERFECT CHRISTMAS GIFT


UFC
THE OFFICIAL MAGAZINE
BJ PENN
30 DAYS
ABS
HOW TO

Save 59%
$19.99 for 7 issues

THE WORLD'S NUMBER ONE PC GAMES MAGAZINE
PC GAMER
PREVIEWS!
GTA V COMES TO PC
BATTLEFIELD HARDLINE

Save 82%
$19.95 for 12 issues


Mac|Life
IMPROVE YOUR LIFE WITH
iCLOUD

Save 65%
$24.95 for 12 issues

MAXIMUMPC
LIBERATE YOUR MEDIA!

Save 79%
$19.95 for 12 issues

XBOX
WORLD EXCLUSIVE
HOMEFRONT
THE REVOLUTION

Save 77%
$24.95 for 12 issues

- **Save up to 82%** off the cover price
- **Home delivery** included in the price
- **The gift** which lasts a whole year!

2 easy ways to order

shop.futureus.com/subscriptions

Or call toll free: **1877 421 0583**
quote **Z501**

Savings compared to buying a year's worth of full priced issues from the US newsstand. Two year pricing and Canadian pricing by request. This offer is for new print subscribers only. You will receive 12 issues in a year (apart from UFC which publishes 7 issues a year). Prices correct at point of print and subject to change. **Offer ends: 31st January 2015**

Samsung 850 Pro

Big fish in a small pond

This is Samsung's first "Pro" SSD that's larger than 512GB.

SAMSUNG HAS BUILT a good reputation for fast and high-quality SSDs. It introduced the 470 to desktops four years ago, and its SSDs were in high-end laptops before that. The company also distinguished itself by designing its own controller chips and manufacturing its own NAND flash memory. Indeed, Samsung's reduced reliance on partners has given it greater opportunities to try different things. The result? The 850 Pro combines all that expertise and strategic advantage in one blisteringly fast piece of hardware, but at a hefty price.

As we went to press, the 1TB model had a street price of $650. The 512GB model was $350, and the 256GB model was $200. For reference, the company's 1TB 840 EVO could be had for $418 (and it's no slouch), and the 512GB Crucial MX100 was going for $210. To be fair, our testing indicates the 850 Pro is the fastest desktop SSD around. It also has some pretty fancy technology, such as 3D V-NAND. "V" stands for "vertical." The tech layers NAND chips on top of each other, saving space for higher storage capacities. Samsung has used this before, but it's been refined, upping the layer count from 24 to 32. The 850 Pro also sports Samsung's Rapid Mode, which uses part of your system RAM as a drive cache. This has doubled transfer speeds in previous tests.

THE POWER OF MAGIC

Samsung has also brought in TCG Opal 2.0, so it has some nice self-encryption features, always important on theft and loss-prone laptops. It's also keeping Dynamic Thermal Guard, designed to prevent your SSD from getting cooked in the heat. Lastly, Samsung has its slick Magician software, a hub for jobs like getting firmware updates, performing manual garbage collection, and enabling Rapid Mode. SanDisk and Corsair are developing similar software, but there's a noticeable gap. Magician has the look and feel of something you would expect to pay for separately.

BENCHMARKS

	Samsung 850 Pro	Samsung 840 Pro	Samsung 840 Evo	SanDisk Extreme Pro	Crucial M550
Controller	MDX	MDX	MEX	Marvell	Marvell
Capacity	1TB	512GB	1TB	480GB	1TB
Street Price	$650	$295	$418	$320	**$470**
Warranty	10 years	5 years	3 years	10 years	3 years
CrystalDiskMark					
Avg. Sustained Read (MB/s)	**959**	555	950	531	501
Avg. Sustained Write (MB/s)	698	684	**701**	503	482
AS SSD – Compressed Data					
Avg. Sustained Read (MB/s)	3,604	**3,620**	3,528	514	514
Avg. Sustained Write (MB/s)	2,431	**2,988**	2,444	486	478
ATTO					
64KB File Read (MB/s)	**834**	741	460	474	466
64KB File Write (MB/s, 4QD)	**1,995**	1,985	1,706	524	470
Iometer					
4KB Random Write 32QD (IOPS)	90,952	91,759	**92,573**	44,334	84,748
PCMark Vantage x64	75,003	75,205	61,901	47,055	**76,251**
Sony Vegas Pro 9 Write (sec)	**272**	294	274	**272**	315

Best scores are bolded. All tests are conducted on our hard drive test bench, which consists of a Gigabyte Z77X-UP4 motherboard, Intel Core i5-3470 3.2GHz CPU, 8GB of RAM, Intel 520 Series SSD, and a Cooler Master 450W power supply.

The 850 Pro does excellently, but you can see from the charts that the SATA III bus has become a bottleneck for premium SSDs, even when you enable Rapid Mode. This mode allocates several gigabytes of your system RAM to your Samsung SSD, to use as a high-speed cache. The most commonly accessed files will get stored here, for quicker retrieval than the drive can accomplish with its own internal memory cells. Performance will be slower when dealing with files larger than the cache can hold. But overall, Rapid Mode will push day-to-day performance past what you'll see from non-Samsung SSDs (at least, the ones that don't use their own RAM cache).

But it's hard to shake the feeling the 850 Pro's extra cost comes from its lengthy warranty, and, with SSD tech evolving so quickly, that isn't compelling enough to make the price work. M.2 and SATA Express are coming. And those aren't even the long-term solution. NVM Express is the true heir to the I/O throne, and it will be well-established before the 850 Pro's huge warranty comes into play. –TOM MCNAMARA

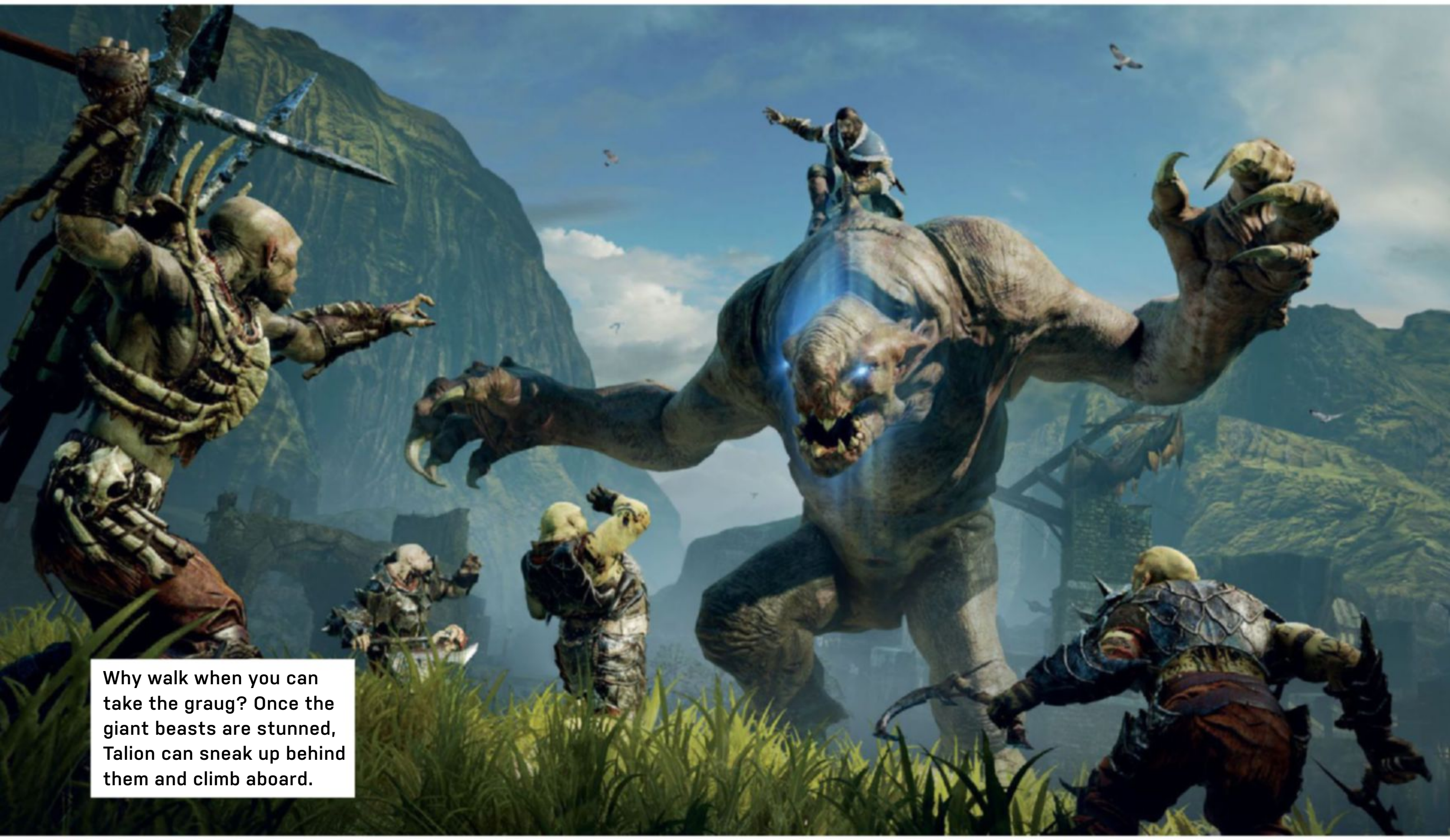
VERDICT 9

Samsung 850 Pro

BALD EAGLE Super fast; 10-year warranty; slick software that could be a stand-alone product.

HAIRLESS CAT Quite expensive for what you're getting; warranty is overkill.

$650, www.samsung.com



Why walk when you can take the graug? Once the giant beasts are stunned, Talion can sneak up behind them and climb aboard.

Middle-Earth: Shadow of Mordor

One Tolkien game to rule them all

GHÛRA THE FUNNY ONE isn't laughing. We suspect the name's ironic. The hulking orc has never been good at telling jokes, from what we can tell, and it doesn't help that he's now sporting a nasty gash from where we thunked an arrow at his head somewhere in the barrows of Udûn.

And now, all on his lonesome, he's tracked us down over the muddy Black Road across untold miles to take revenge. Good timing, too. We're currently stuck parrying the spear of Lûga Ghûl Lover. One uruk captain is bad enough, but in our state, two is a death sentence. "You're going to pay for smashing my face," he screams. We're already running, and we suspect he'll mock us for it when we meet again.

The great pleasure of playing *Shadow of Mordor* is that this isn't a mission. It's an encounter that's only occurred due to (poor) choices we've made. It's an open-world adventure with combat and platforming that owes heavy debts to the best action-adventure games of years past, but it blazes a trail for future games with a vendetta system that weaves endless unscripted narratives across Sauron's front door. It plays a key role in generating side missions and is just as strong as the main story.

This is the tale of Talion, a Gondorian ranger who's lost his wife and son (and his own life, at that) to a band of marauding orcs. So far, so formulaic. But above this deceptively flimsy foundation stands a story that should appeal to even the most disgruntled of academic Tolkienists. Talion's misadventures start the night Sauron returns to Mordor, and his subsequent mysterious resurrection pairs his body with the wraith of an elf lifted from Tolkien's *Silmarillion*. The cutscenes look as though developer Monolith pulled them from a proper Peter Jackson production, but at times *Shadow of Mordor* sags, relying too heavily on nods to the fandom. They're not even subtle. One second someone will bark at Talion to "Fly, you fool," the next he's told that, "Not all those who wander are lost."

KEEP YOUR ENEMIES CLOSE

We get it. This is clearly Middle-earth, or at least a fraction of it. *Shadow of Mordor* takes its title a little too literally for a series that's always enjoyed going "there and back again." We'd hoped for views of Moria or Rohan. Instead we get bleak, barren Mordor and slightly greener, wetter Mordor. But the narrow focus is a small drawback of the two massive maps that make up the open world surrounding Talion. It's a varied world that's fun to explore, filled as it is with ramshackle uruk forts and the spectral remnants of a lost civilization.

It's also the breeding ground for *Shadow of Mordor*'s remarkable "Nemesis" system that creates a world where life seems to go

ABOVE Surprise, surprise. Gollum's precious personality puts in an appearance, with a story arc of his own.

ABOVE RIGHT You play as Talion, a resurrected ranger possessed by a wraith who's handy with a sword.

on regardless of what Talion's doing. Take Zunn the Brewer, the first orc to kill us. Back then he was just another nameless face, but killing us changed him. It gave him a name, and a promotion to captain. That gave him spiffy individualized armor, his own abilities, and made it harder to take him down.

We never got around to killing Zunn. We crossed swords again once, but he escaped while his buddies and wargs kept us occupied. Later he killed us again—we blame the frame rates, more on them later—earning him another promotion. In time, the oaf became a warchief, a rank that requires special challenges such as killing 10 enemies by stealth to even spawn Zunn and his bodyguards. It's a great system that punishes death by empowering your killer, and rewards victory through the satisfaction of revenge. And *Shadow of Mordor* brims with such stories. Consider Ûshbaka the Infernal, a nut who balances a burning cauldron on his noggin. Or Ûshgol the Ear Collector, whose necklace proves he takes his hobby seriously. This endless dance of revenge and colorful characters with their own voiced personalities and memories of past encounters creates a story beyond the main narrative that lingers long after the memory of Talion's troubles fade away.

And that's but the surface. Further nuances lie beneath, such as the way some background orcs chatter about your failures, or how you can use your wraith buddy's powers to rip information from an orc's brain.

A typical fight sees us zipping across towers and walls, stealth-killing archers, and poisoning the uruk's grog. Such actions (along with Talion's hunt for lore objects and glowy runes) bear the heavy stamp of *Assassin's Creed*, but the core combat is pure *Batman: Arkham Asylum*, and *Shadow of Mordor* is all the better for it, notably when brawls explode into battles.

LET'S HUNT SOME ORC

We're doing well. We've built up a hit streak that lets us execute an orc in the thick of battle. It's one of the many talents we've gained by unlocking skill tiers from killing captains. Another lets us stun orcs when we vault over them. But that's just the half of it. Talion, of course, shares his own body with Mr. Ancient Elf, and it's the latter who lobs arrows while in a state akin to *Arkham Asylum*'s Detective Vision. It transforms him into a battlemage of sorts. We press R after building a hit steak, and Talion slams his fist down, sending orcs around him reeling back from the shockwave. We press Z with the bow in action, and he zips toward an enemy as though teleporting. Later in the game he learns to "brand" orcs, turning them into mind-slaves. It's a shaky moral shift that even Talion seems uncomfortable with, and it's a fitting homage to the theme of corruption that runs through Tolkien's works.

We do regret that Talion never doffs his tattered ranger's cloak. Switching to flashier threads is one of the things we love most about *Assassin's Creed*. Not so here. But *Shadow of Mordor* makes up for some of that loss with a rune system that replaces traditional loot. As they drop from the captains and warchiefs, they yield a compelling reason to hunt them down, even if you're not big on revenge. One rune might ignite enemies when you counter with your sword, another might make you immune to poisons.

But tell us how the thing *runs*, right? We walked into Mordor with a humble AMD 2.8 GHz processor, 16GB of RAM, and an Nvidia GeForce GTX 750 Ti on Windows 7. Somehow we played the entire game on Ultra settings, although there's no difference between that and the High settings unless you download the Ultra HD texture pack. Most of the time our PC actually fared well, despite running hot, but we wouldn't recommend it if you've a similar rig. Frame rates would plummet to a slideshow when Talion was in cramped villages, surrounded by dozens of orcs, or bombarded with many explosions.

Those moments aren't that common, however, and we found the occasional stutter worth it since *Shadow of Mordor* approaches *Witcher 2* levels of beauty when pumped up on graphical adrenaline. We hope Mordor surpasses it with the texture pack installed, but at the time of writing, we don't know. Considering the demands the High setting put on our system, the Ultra texture pack must be a beast. But *Shadow of Mordor* still looks stunning on lower settings. Even if you can't experience the glory that is Ultra, you shouldn't miss out on what is the best *Lord of the Rings*-based game to date. –LEIF JOHNSON

VERDICT
8

Middle-earth: Shadow of Mordor

+ LORDS IT Excellent "Nemesis" system; a huge and varied open world; stunning graphics.

− DROPS THE RING Demanding tech specs; panders to fanboys too much; playable world is limited to Mordor.

$50, www.shadowofmordor.com, ESRB: M

LAB NOTES

TOM MCNAMARA **TECHNICAL EDITOR**

The Future Looks Bright

Fancy new hardware is on its way, and we can't wait

WHILE MANY STILL HAPPILY GAME AWAY with the Core 2 Quad Q6600 they bought eight years ago (and more power to them), a lot of new things are brewing. AMD has brought the Mantle API to compete with DirectX, a move that managed to distract Microsoft enough to develop DirectX 12, which will emulate Mantle's lower-level access to the hardware. We'll be seeing Mantle in huge games such as *Civilization: Beyond Earth*, *Dragon Age: Inquisition*, and *Star Citizen*, to name but a few.

For its part, Nvidia is bringing a voxel-based engine called VXGI that will illuminate scenes with a level of realism that even ambient occlusion can't touch. And its GeForce GTX 970 and 980 cards hungrily devour benchmarks for breakfast while using a fraction of the wattage. And let's not forget Oculus Rift, the multibillion-dollar enterprise snapped up by Facebook that may finally bring VR gaming to the masses.

In this brief window of time, the clouds of the crystal ball recede and we can peek a few months into the future, where the world of technology floats in a steady state of promise and hope. No politics, no drama. The most difficult task is not how far we can extend our vision into this realm, but how well we can remain tethered to the realities of the here and now. A lot of our current gear is perfectly suitable for our foreseeable needs. But we can take this opportunity to save up our ducats and dig up all the nitty-gritty details on the stuff coming soon that really lights our fire.

Chris Roberts's *Star Citizen* will require some serious horsepower.

GORDON MAH UNG

Editor-in-Chief

Testing Chromebooks isn't as easy as testing Windows PCs. There's no way to control the browser version, which on Chrome OS has major impacts on performance. So for every Chromebook review, I literally have to retest every single Chromebook I want to use for comparison. Even worse, sometimes Google will push out an update while you're testing. That's what happened this month with its flagship Google Pixel, which received an OS update just as I finished testing. That means retesting the Chromebook, again. Worse yet, there was no such update for the pair of Acer Chromebooks I was testing, so any comparison would look like pineapples to pears.

JIMMY THANG

Online Managing Editor

Smart watches appear to be the new over-hyped gadget, and while people like Gordon might scoff at the concept as being too hipstery or just a gimmick, I like to think I'm a little more open-minded. But although I want to like them, smart watches also inspire a healthy skepticism in me. Having received LG's and Samsung's offerings recently, I hate to say that I think your smartphone can already do most of the stuff they do, but better. While I haven't had a chance to do a deep dive on them yet, they seem like a solution looking for a problem.

First Look: GeForce GTX 900M Series GPUs

Desktop-grade graphics in a portable form factor

IT SEEMS LIKE only yesterday that Nvidia launched its 800M GPUs, but here we are again with the Green Team unleashing its 900M series beasts. With gaming laptop sales increasing roughly 75 percent year-on-year over the past three years, however, it's easy to see why Nvidia would be all over the mobile-GPU bandwagon. Leading the pack this time around are Nvidia's new 980M and 970M graphics cards, the former being the company's new flagship mobile GPU, which it claims is the fastest in the world.

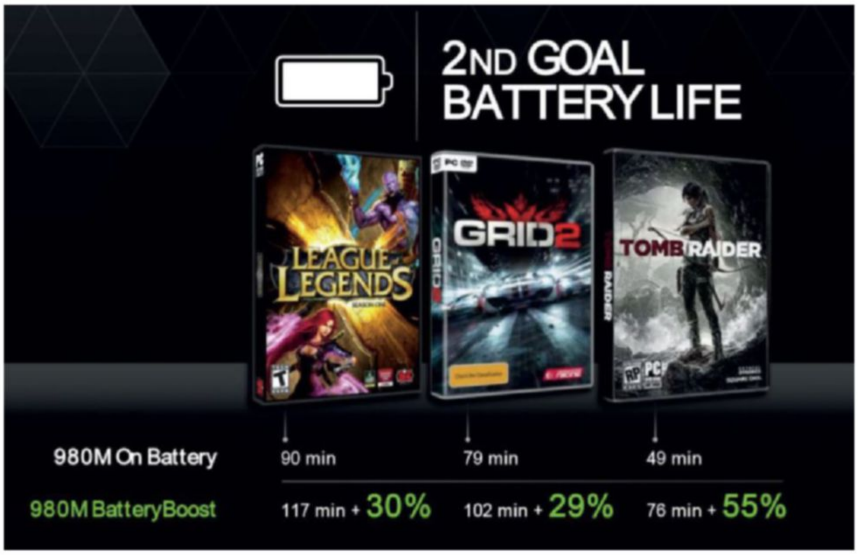
The nice thing about the two cards is that they're based on the company's new Maxwell architecture, which we first saw in mobile GPUs starting with the 860M. Nvidia claims Maxwell is four times as power-efficient as Fermi, the architecture it used two generations ago.

Nvidia also claims the 980M is about 75 percent as fast as its blazingly powerful desktop counterpart. The extra horsepower is much appreciated, as it seems the wave of ultra-high resolution displays is well on its way. To take advantage of these panels, Nvidia claims the 980M is powerful enough to run most games maxed out at 2560x1400.

These new Maxwell GPUs will also support Nvidia's latest graphical features, such as Voxel Global Illumination (VXGI), Multi-frame Antialiasing (MFAA), and Dynamic Super Resolution (DSR). For the uninitiated, VXGI allows the GPU to render dynamic shadows, MFAA offers similar antialiasing to MSAA while being 30 percent faster, and DSR allows the GPU to render games at UHD resolutions, and then downscales them to 1080p monitors.

One returning tech that Nvidia is touting is Nvidia Battery Boost, a feature that throttles GPU performance down to as low as 30fps to optimize battery life. If you've been following our coverage of Battery Boost, you might recall how disappointed we've been with it. From our testing, Battery Boost seems to have little-to-no impact on battery life. When we met with Nvidia, the company acknowledged it hasn't done the best job of working with OEMs to implement the feature, which it says it's now working hard to rectify. Nvidia claims that according to its internal tests, Battery Boost can increase battery life anywhere from 29 to 55 percent in games such as *League of Legends* and *Tomb Raider*.

We won't be able to verify these claims, of course, until we put these next-series mobile GPUs through their paces. Stay tuned for more mobile benchmarks on the latest gaming laptops in the coming months. **–JT**



2ND GOAL BATTERY LIFE

	League of Legends	GRID 2	Tomb Raider
980M On Battery	90 min	79 min	49 min
980M BatteryBoost	117 min + 30%	102 min + 29%	76 min + 55%

Nvidia's Battery Boost feature for laptops has been underwhelming so far.

GEEK TESTED & APPROVED

Microsoft Arc Bluetooth Mouse

FOR ROAD WARRIORS, Microsoft's Arc Mouse has been a staple since it was introduced way back in 2008. The latest iteration, the Arc Mouse Bluetooth, has been updated for modern times. Gone is the need for a wireless dongle. Instead, you can use Bluetooth 4.0 to connect to your laptop.

There are a few other features on-the-go users will appreciate, first being the ability for the mouse to fold flat when not in use. You can literally put the mouse in the sleeve with your laptop and not worry about it putting a major divot in your Ultrabook. Also, when you fold the mouse flat, it automatically shuts off. Another nifty trick making a return in the newest AAA-powered Arc Mouse is the touch surface used for scrolling. Microsoft integrated haptic feedback to simulate the feel you'd get when scrolling with a normal mouse. The mouse also features a BlueTrack sensor, which Microsoft says will work on most mousing surfaces you'll run into. Well, except for glass surfaces. And it's true, too—we had no problems using our pants leg as an ad hoc mouse pad.

But this rodent isn't perfect. Full support for OSes older than Win8 isn't there yet, and if you tend to rest your pinkie on your mouse, you'll find it curling underneath. It's a compromise we'll make, however, to get the portability. **–GMU**

$70, http://bit.ly/MPC_MSArcMouse

The Arc folds flat to fit in your laptop sleeve.

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> CPU Cores
> Rig Maintenance
> Mobo Upgrade

The Core of the Issue

I run an Intel Core i7-2600 with an SSD operating system drive and DDR3 memory, all at stock speeds. I mostly play MMO games like *World of Warcraft* and *StarCraft*. Would I notice much difference by upgrading to an i7-5820K with DDR4, without OCing it?

—**Randy Copeland**

TECHNICAL EDITOR TOM MCNAMARA RESPONDS: You can check this kind of thing in Windows by hitting Ctrl+Shift+Esc to open the Task Manager, clicking on the Performance tab, and looking at the usage pattern of each CPU core. (In Win8, you'll also need to right-click on the graph and choose "Change graph to → Logical processors.") The 2600 gives you eight CPU threads. The activity graph will show you that Blizzard games usually don't use more than two, so going from eight to 12 wouldn't do much, at least for gaming. Generally speaking, games benefit more from a GPU upgrade than a CPU upgrade.

Freebie Dilemma

I just received a free Gigabyte GA-X99-UD5 motherboard, and from what I have read (in your mag), that has the new CPU socket and DDR4 support. My problem is I just upgraded my old Velocity Micro with a new mobo, RAM, CPU, OS, and GPUs. My current system is an Asus P8Z77-V LK, Core i7-3770K, two sticks of 8GB Corsair DDR3/1600, two Asus GeForce GTX 650 Ti in SLI, H60 CPU cooler, Asus PCIe 802.11AC adaptor, Samsung EVO 240, Seagate 2TB HD, WD 500GB HD, two ODDs, and all stuffed into a Corsair Graphite Series 730T. Would I be able to use my Core i7-3770k socket LGA 1155 in the Gigbyte GA-X99-UD5 MB? What about any of my older gear? My current build is plenty fast with an OC of 4.5GHZ on the CPU, so what to do?

—**Edward Sawacki**

EDITOR-IN-CHIEF GORDON MAH UNG RESPONDS: First, no. You can't use your Core i7-3770K in the new board, nor can you use the DDR3, so those would have to be purchased. The question is: Should you do it? I can't answer that without knowing what you do with your PC. Besides going from Ivy Bridge to Haswell cores, the primary advantage is more cores. X99 lets you run from six-core to eight-core configurations, while LGA1155 maxes out at four. If you're primarily a gamer then paying for the new CPU and DDR4 doesn't make much sense—you won't benefit enough from extra cores to be worth it.

If you use your box for video-encoding, transcoding, 3D rendering, or any professional tasks, the extra cores are worthwhile if you're getting paid for it. You can see more detail on this in our cover story, which puts a four-core against the six-core part. Another thing to consider is storage. Z77 is limited to two native SATA 6Gb/s ports, while X99 gives you six. To some, that's worth the upgrade, too.

So, the easy answer is this: If I were an 80 percent gamer, I'd sell the mobo and the two 650 Ti cards and buy a GeForce GTX 970 or two, depending on how much I could get for the parts. If I pushed pixels for a living, I'd sell off the Core i7-3770K and RAM and build on the new Core i7-5820K.

4K? Not Yet

Hey guys, your recent 4K monitor article (December 2014 issue) basically summarized in my mind as, "We're not quite there yet." And to be honest, I'm not really interested in anything smaller than 32 inches for 4K. What I really want is 40 inches! I've been running a surround setup with 3x Dell U2410 monitors in portrait mode, for an effective resolution of 3800x1920, close to but not quite Ultra HD. But those bezels, man... those bezels. If I could get the same screen size and resolution without the bezels, now that would be just simply awesome! So, here's what I want to know: Now the Nvidia GTX 980 is out, can that be paired with something along the lines of a Samsung HU7000 40-inch UHD 60Hz TV for an effective PC gaming setup? Will it work? Any drawbacks? You guys should test it!

—**Saul Boucher**

TECHNICAL EDITOR TOM MCNAMARA RESPONDS: Saul, since that TV has HDMI 2.0 inputs, this setup should work. But I'd recommend at least two GTX 980s to handle 4K resolution. You could also get two GTX 970s and overclock them. You could actually get three 970s for the price of two 980s, and then you're cooking with some gas. The 970s have a TDP of just 145 watts at stock clock speeds,

↘ submit your questions to: comments@maximumpc.com so you wouldn't need a ridiculous power supply. But for three cards, you will need six PCI Express cables, so there's that.

> I TRULY ENJOY YOUR MAGAZINE, EVEN WHEN I DON'T KNOW WHAT THE FRELL YOU'RE TALKING ABOUT!

Keep on Running

Hello there. I've finally built my PC, with much help from your articles, actually. My question is: Now that I've built my rig, how do I keep her running in tip-top shape?

—Christian Waters

TECHNICAL EDITOR TOM MCNAMARA RESPONDS: We actually have a few articles dedicated to this. You can download them for free from our archive at http://bit.ly/mpcpdfs. You want the March 2013 and May 2014 issues.

Sandy Bridge Over Troubled Waters

Hi, I've been a subscriber since the *boot* days, and truly enjoy your magazine, even when I don't know what the frell you're talking about! I read the June feature about upgrading, and I'm curious about your thoughts on my system, which is 3.5 years old. I'm running an Asus P8P67 Pro mobo, with an i5-2500K running at 3.30GHz. My video card is an EVGA GTX 570 SuperClocked, and I have 8GB of 1,600MHz DDR3. The games I'm looking forward to playing at very high settings are *Elite Dangerous*, *Star Citizen*, *No Man's Sky*, *Shroud of the Avatar*, and *Witcher 3*. Other than adding an SSD, and not being too concerned about cost, what, if any, upgrades would you recommend? Thanks.

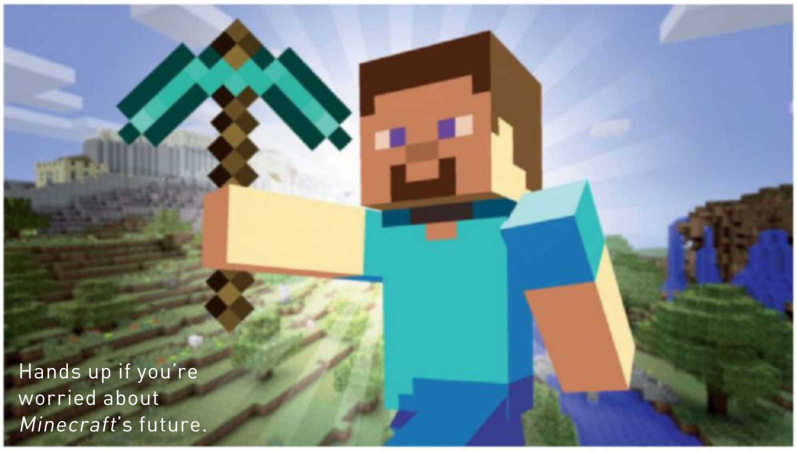
—Bob Ingber

TECHNICAL EDITOR TOM MCNAMARA RESPONDS: Overall, this system is still just fine for most games at 1080p. *Star Citizen* and *Witcher 3*, however, will be a challenge for a GTX 570. I'd recommend upgrading to a GTX 970. It has a good balance of price, performance, and power consumption. You can pick one up for around $350.

[MAXIMUM DEBATE]

MICROSOFT'S MINECRAFT ACQUISITION

Microsoft purchasing *Minecraft* developer Mojang for $2.5 billion has sparked a lot of debate. Online managing editor Jimmy Thang thinks Microsoft paid too much, may potentially ruin the franchise, and won't ever recoup its spend. But online contributing editor Sean Knight disagrees. He thinks the game hasn't yet reached critical mass and will be able to make a ton of money off of *Minecraft*-branded toys alone. Read along as they duke out their points in our new Maximum Debate feature. You can also vote in the online poll. http://bit.ly/MPCdebate



Hands up if you're worried about *Minecraft*'s future.

Facebook Polls

Devil's Canyon or Haswell-E: You Decide

We asked what you think you'll build on next: the Core i7-4790K Devil's Canyon, the Core i7-5820K Haswell-E Lite, or neither?

Jakub Bartnik: The Core i5-4690k is just perfect for gaming and it isn't priced at $390.

Dave Hicks: Since we all know hardware is waaaaaay ahead of any software currently in production, what's the point? My first generation i7 quad-core runs anything out there. Until some kind of monumental software upgrades arrive, hardware is stagnant.

Cenydd Smith: Neither. I build a cracking PC based on latest tech every five years. With three years to go, it won't be either of those!

Paul Brooks: 4790K. I'd rather have fewer faster cores for gaming.

Keith Jarrell: Neither. AMD FX series, baby.

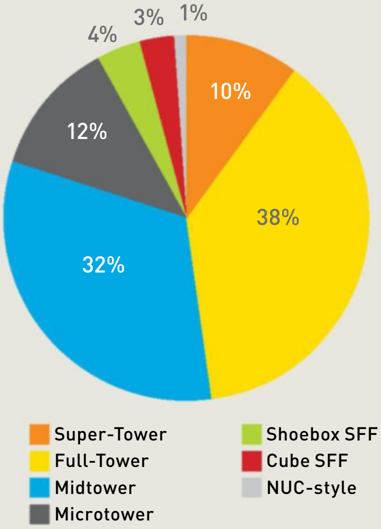
Jeff Schnurr: My Core 2 Quad Q6600 would like to have a word with you.

Matthew Brown: Devil's Canyon. I want to hear my old CPU scream as it gets thrown from the plane.

Michael Sebren: The Core i7-5820K can access twice the memory at almost three times the speed. Hello, greased lightnin' RAM drive!

Bradley Peleshaty: I have a 4790k and my only complaint is that Intel said they will hit 5GHz on air. Lol, not even close. 4.7 stable max, maybe 4.8 if I try hard enough, but temps are 85 with a Nepton 280L.

What's Your Favorite PC Form Factor?



Like our page at
www.facebook.com/maximumpc

MAXIMUM PC AT ITS BEST
ANYTIME, ANYWHERE!

HELLO, 4K LCD!
Asus 31.5-inch panel boasts four times the resolution of 1080p PG. 76
AC ROUTERS ARRIVE
Seven 802.11ac Wi-Fi routers demo the new spec's capabilities PG. 34
ASROCK M8
Build your own micro-tower with this BMW-designed bare-bones kit PG. 74
MAXIMUMPC
MINIMUM BS • FEBRUARY 2014 • www.maximumpc.com
SUPERCHARGE YOUR PC
MOVE YOUR OS TO AN SSD AND REAP AMAZING REWARDS—WE SHOW YOU HOW! PG. 22
BUILD IT:
AMD's R9 290X in a small form factor PC! PG. 58
Future
$7.99US
02

Print or Digital subscriptions available!
www.maximumpc.com/anywhere

Sponsored by newegg.com
TAKE IT FROM A GEEK.℠

THE BUILDS

BUDGET GAMER

INGREDIENTS

PART			PRICE
Case	NZXT Source 210 Elite		$52
PSU	Corsair CX500M 500W	**NEW**	$35
Mobo	Gigabyte GA-H97M-HD3		$83
CPU	Intel Core i3-4150		$120
GPU	MSI Radeon R9 280 Gaming 3G	**NEW**	$156
RAM	2x 4GB G.Skill Sniper Series 8GB (2x4GB) DDR3/1866		$74
SSD	128GB SanDisk Ultra Plus		$66
HDD	Seagate Barracuda 1TB		$60
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $744

AMD INDICATED the Radeon R9 280 would no longer be available as we went to press. But it's still here, and getting cheaper, so we'll still recommend it. At $156 (after a $30 mail-in rebate), this MSI version is fantastic value. It might not be as fast as the 285, but its extra 1GB of VRAM might give it more longevity. We've also switched to the modular version of the Corsair CX500, since a nice rebate was available. Other than that, this build remains the same. Intel's Haswell-based Core i3 CPUs are snappy, and this H97 motherboard will be compatible with next year's Broadwell generation. NZXT's Source 210 Elite case remains competitive, and SanDisk makes some great SSDs.

MIDRANGE

INGREDIENTS

PART			PRICE
Case	Corsair Vengeance C70		$108
PSU	EVGA SuperNOVA 750 G2 220-G2-0750-XR 750W	**NEW**	$80
Mobo	Gigabyte GA-G1.SNIPER Z97		$161
CPU	Intel Core i5-4690K		$240
Cooler	Cooler Master Nepton 280L		$100
GPU	MSI GeForce GTX 970 GAMING 4G	**NEW**	$350
RAM	2x 4GB G.Skill Sniper Series 8GB (2x4GB) DDR3/1866		$74
Optical Drive	Samsung SH-224DB/BEBE		$20
SSD	Crucial MX100 256GB		$116
HDD	Seagate Barracuda 3TB ST3000DM001		$103
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $1,452

NVIDIA'S GEFORCE GTX 970 is a heck of a card for $350, so it replaces the Radeon R9 290. We haven't tested this specific card yet, but we've tested MSI's GTX 980 version of it. The 970 is a power-efficient card, but this EVGA SuperNOVA 750 G2 had a nice rebate, even though it's more power than we'll need. We recommend PSUs that have a unified 12-volt rail, which some EVGA units don't have, for more efficient power distribution. This one also has a 10-year warranty. The rest of the system is unchanged. The Intel Core i5 remains an excellent general-purpose CPU, and the Gigabyte Sniper mobo has a premium audio chip from Creative Labs. Crucial has a good rep for SSDs.

TURBO

WE'RE STICKING WITH THE LGA 2011-3 platform here, since the price difference between this and an LGA 1150 system is not that big at this price level. We get four additional CPU threads from the Core i7-5820K, 12 more PCI Express lanes from the Gigabyte motherboard, and 16GB of 2,400MHz DDR4. It'll handle our dual GeForce GTX 980s without breaking a sweat. If you wanted to add a third 980, though, we'd recommend upgrading from the EVGA SuperNOVA 750 G2 to a kilowatt power supply. You could also go with GTX 970s, which perform quite well and cost a lot less, but we prefer to put the highest-end stuff in this Turbo build. Your mileage may vary. The 500GB Samsung 840 Evo remains great value, though the company sounds like it will be coming out with an 850 version of this tier soon. You might scoff at a Blu-ray player, but some of us old fogeys prefer the superior image quality and sound that optical media still has over the usual streaming options.

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART			PRICE
Case	NZXT Phantom 530		$130
PSU	EVGA SuperNOVA 750 G2 220-G2-0750-XR 750W	**NEW**	$80
Mobo	Gigabyte GA-X99-UD4		$258
CPU	Intel Core i7-5820K		$385
Cooler	Cooler Master Nepton 280L	**NEW**	$100
GPU	2x MSI GeForce GTX 980 Gaming 4G	**NEW**	$1,200
RAM	4x 4GB Crucial Ballistix Sport DDR4/2400 4x4GB		$234
Optical Drive	LG Blu-ray Burner WH16NS40		$70
SSD	Samsung 840 EVO 500GB MZ-7TE500BW		$235
HDD	Seagate Barracuda 3TB ST3000DM001		$103
OS	Windows 8.1 64-bit OEM		$100

Approximate Price: $2,895

UPGRADE OF THE MONTH

NVIDIA GEFORCE GTX 970

GTX970
NVIDIA

The Zotac card we got in for testing is over $400, so we can't universally recommend that version. But we can advise you get a GTX 970 if you have a GTX 680 or something slower. It doesn't need much power, it can overclock nicely, and it's wicked fast.

$350 (approx.), www.geforce.com

MAXIMUM PC (ISSN 1522-4279) is published 13 times a year, monthly plus Holiday issue following December issue, by Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Phone: (650) 872-1642. Fax: (650) 872-2207. Website: www.futureus.com. Periodicals postage paid in San Bruno, CA and at additional mailing offices. Newsstand distribution is handled by Time Warner Retail. Basic subscription rates: one year (12 issues) US: $19.95; Canada: US$24.95; Foreign: US$34.95. Canadian and foreign orders must be prepaid. Canadian price includes postage and GST (GST #R128220688). PMA #40612608. Subscriptions do not include newsstand specials. POSTMASTER: Send changes of address to Maximum PC, PO Box 5852, Harlan, IA 51593-1352. Standard Mail enclosure in the following editions: None. Ride-Along enclosure in the following editions: None. Returns: IMEX Global Solutions, PO Box 25542, London, ON N6C 6B2, Canada. Future US, Inc. also publishes @Gamer, Crochet Today!, Mac|Life, The Official Xbox Magazine, and PC Gamer.

Entire contents copyright 2014, Future US, Inc. All rights reserved. Reproduction in whole or in part is prohibited. Future US, Inc. is not affiliated with the companies or products covered in Maximum PC. Reproduction on the Internet of the articles and pictures in this magazine is illegal without the prior written consent of Maximum PC. Products named in the pages of Maximum PC are trademarks of their respective companies. PRODUCED IN THE UNITED STATES OF AMERICA.

MAINGEAR
FORCE
MAINGEAR
RUSH
MAINGEAR
TORQ
MAINGEAR
MAINGEAR
MAINGEAR

EPIC PERFORMANCE

MAINGEAR'S custom gaming desktops and laptops combine the perfect balance of high performance and style. Choose from multiple models of desktops and laptops powered by the latest Intel Extreme Edition processor and NVIDIA graphics that will satisfy the most demanding gamers, as well as high quality auto finish paint options . Whether it's a small quiet gaming desktop, or an extreme fully loaded overclocked PC, MAINGEAR can help customize your ultimate gaming PC.

ENTER CODE: MAXPC100 & MAXPCGFS
at checkout and get $100 of any VRTX or EPIC Series Desktop and also get Free Ground Shipping.*

intel inside™ CORE™ i7

Call: **1-888-MAINGEAR** or Visit: **WWW.MAINGEAR.COM/MAXPC**

MAINGEAR

Become a fan **facebook.com/maingear** or follow us **twitter.com/maingear**

© 2014 MAINGEAR, the MAINGEAR logo, and the SHIFT are trademarks of MAINGEAR Corporation. All rights reserved. Intel, the Intel logo, Intel Core and Core Inside are trademarks or registered trademarks of Intel Corporation or it's subsidiaries in the United states and other countries. All other trademarks are the property of their respective owners. All rights reserved. All other trademarks are the property of their respective owners. MAINGEAR can not be held responsible for errors in photography or typography. Actual case may vary in design. Availability may change without notice. *Cannot be combined with other offers. Promotion expires Nov. 30, 2014 .

"RECORD BREAKING PERFORMANCE"
- Maximum PC **Editor's Choice**

DIGITALSTORM®

CUSTOM PCs

Designed with a passion for breakneck performance, Digital Storm custom built systems are expertly built and tested with unmatched engineering that stands out and above the competition.

CUSTOMIZE NOW: WWW.DIGITALSTORM.COM

The Digital Storm Logo, and 'World's Most Advanced PCs' are trademarks of Digital Storm.

Intel, the Intel Logo, Intel Inside, Intel Core, and Core Inside are trademarks of Intel Corporation in the U.S. and/or other countries.